

# Dr. Benjamin J. Knurr

Biological and Physical Sciences Department  
Assumption University  
500 Salisbury Street  
Worcester, MA 01609

Testa 210  
phone: (508)-767-7381  
bj.knurr@assumption.edu

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## Education:

**PhD Chemical Physics** **December 2014**  
University of Colorado, Boulder, CO  
Thesis Title "Infrared Photodissociation Spectroscopy of Anionic Gas Phase Clusters"  
Advisor: Professor J. Mathias Weber

**BA Chemistry** **May 2009**  
Macalester College, St. Paul, MN

## Current Position:

**Assistant Professor** **September 2015 - present**  
Assumption University  
Chemistry faculty teaching primarily general chemistry and physical chemistry (lectures and labs) and performing independent research with undergraduate students.  
*General Chemistry I* – CHE 131 and CHE 131L  
*General Chemistry II* – CHE 132 and CHE 132L  
*Physical Chemistry I* – CHE 311 and CHE 311L  
*Physical Chemistry II* – CHE 312 and CHE 312L  
*Natural Science Independent Study & Journal Club* – NAT 391

## Previous Positions:

**Lecturer** **Jan. 2015 - Aug. 2015**  
University of Colorado Denver  
Primary instructor for an undergraduate and a graduate course offered by the chemistry department.  
*General Chemistry II* – CHEM 2061  
*Environmental Chemistry* – CHEM 4700/5700

**Graduate Research Assistant with Prof. J. Mathias Weber** **Nov. 2009 - Dec. 2014**  
JILA, Department of Chemistry and Biochemistry, University of Colorado Boulder  
Designed a laser vaporization entrainment source for the generation of metal clusters *in vacuo*. Performed infrared photodissociation spectroscopy on a variety of anionic cluster species including naphthalene water clusters and metal carbon dioxide clusters.

## **Graduate Teaching Assistant**

University of Colorado Boulder  
Supervised laboratory experiments, graded lab reports, taught recitation, held office hours, wrote and graded quizzes, helped write and grade exams, helped with laboratory experiment design. \*Head TA  
additional duties: coordinating all other teaching assistants, writing quizzes for all of the sections, being a resource for other TAs.

<i>General Chemistry for Majors</i> – CHEM 1251	<b>Fall 2014</b>
<i>General Chemistry for Engineers</i> – CHEM 1221 *Head TA	<b>Spring 2011</b>
<i>General Chemistry for Engineers</i> – CHEM 1221 *Head TA	<b>Fall 2010</b>
<i>General Chemistry for Majors</i> – CHEM 1271	<b>Spring 2010</b>
<i>General Chemistry for Majors</i> – CHEM 1251	<b>Fall 2009</b>

## Graduate Course Assistant

Aided in the writing, vetting, and grading of graduate level problem sets and exams.

*Advanced Molecular Spectroscopy – CHEM 5591*

*Introductory Quantum Mechanics – CHEM 5581*

*Advanced Molecular Spectroscopy – CHEM 5591*

Spring 2014

Fall 2014

Spring 2012

## Undergraduate Research with Prof. Tom D. Varberg

May 2007 - May 2009

Macalester College, St. Paul, MN

Performed high-resolution laser induced fluorescence spectroscopy on the [17.7]1 state of AuF and the E-2  $\Pi(1/2)-X-2 \Delta(3/2)$  electronic Transition of TaO. Performed REMPI spectroscopy on hexabenzocoronene in the group of Professor Scott Kable (now at University of New South Wales) at the University of Sydney, Australia with Professor Varberg while on his sabbatical.

## Publications:

\* indicates publications with undergraduate coauthor(s)

1. \*Morley S.E., Knurr B.J., “Probing the Role of the Solvation Shell for the Iodine–Starch Complex Using Millifluidic Devices”, *J. Sol. Chem.* **2021**, 50, p. 833-850
2. Knurr B.J., Hauri J.F., “An Alternative to Recycling: Measurement of Combustion Enthalpies of Plastics via Bomb Calorimetry”, *J. Chem. Ed.* **2020**, 97, p. 1465 - 1469
3. Knurr B.J., Weber J.M., “Structures of  $[\text{CoO}(\text{CO}_2)_n]^-$  and  $[\text{NiO}(\text{CO}_2)_n]^-$  Clusters studied by Infrared Spectroscopy”, *J. Phys. Chem. A* **2015**, 119, p. 843 - 850
4. Knurr B.J., Weber J.M., “Structural Diversity of Copper- $\text{CO}_2$  complexes – Infrared Spectra and structures of  $[\text{Cu}(\text{CO}_2)_n]^-$  Clusters”, *J. Phys. Chem. A* **2014**, 118, p. 10246- 10251
5. Knurr B.J., Weber J.M., “Interaction of Nickel with Carbon Dioxide in  $[\text{Ni}(\text{CO}_2)_n]^-$  Clusters Studied by Infrared Spectroscopy”, *J. Phys. Chem. A* **2014**, 118, p. 8753-8757
6. Christopher C.R., Lee S.Y., Gwandu F.B., Matsumoto A.J., Knurr B.J., Mahle, T.K., Morrow Z.W., Varberg T.D., “Rotational and Hyperfine Analysis of the E-2  $\Pi(1/2)-X-2 \Delta(3/2)$  electronic Transition of TaO”, *J. Mol. Spec.* **2014**, 301, p. 25-27
7. Knurr B.J., Weber J.M., “Infrared Spectra and Structures of Anionic Complexes of Cobalt with Carbon Dioxide Ligands”, *J. Phys. Chem. A* **2014**, 118, p. 4056-4062
8. Knurr B.J., Weber J.M., “Solvent-Mediated Reduction of Carbon Dioxide in Anionic Complexes with Silver Atoms”, *J. Phys. Chem. A* **2013**, 117, p. 10764-10771
9. Knurr B.J., McCoy A.B., Weber J.M., “Vibrationally Induced Charge Transfer in a Bimolecular Model Complex in vacuo”, *J. Chem. Phys.* **2013**, 138, p. 224301
10. Knurr B.J., Weber J.M., “Solvent-Driven Reductive Activation of Carbon Dioxide by Gold Anions”, *J. Am. Chem. Soc.* **2012**, 134, p. 18804-18808
11. Knurr B.J., Adams C.L., Weber J.M., “Infrared Spectroscopy of Hydrated Naphthalene Cluster Anions”, *J. Chem. Phys.* **2012**, 137, p. 104303
12. Adams C.L., Knurr B.J., Weber J.M., “Photoelectron Spectroscopy of 1-Nitropropane and 1-Nitrobutane Anions”, *J. Chem. Phys.* **2012**, 136, p. 064307
13. Butler E.K., Knurr B.J., Manke K.J., Vervroot T.R., Varberg T.D., “Excited Electronic States of AuF”, *J. Phys. Chem. A* **2010**, 114, p. 4831-4834

14. Knurr B.J., Butler E.K., Varberg T.D., "Electronic Spectrum of AuF: Hyperfine Structure of the [17.7]1 State", *J. Phys. Chem. A* **2009**, 113, p. 13428-13435

### **Presentations:**

\* indicates presentation with undergraduate coauthor(s)

1. "Connecting Bomb Calorimetry to Environmental Issues: Two Applied Bomb Calorimetry Experiments," (oral)  
ACS National Meeting, Atlanta, GA, August 2021
2. \*"Using Millifluidic Devices to Investigate the Role of the Solvent Environment for the Iodine-Starch Complex," (poster)  
ACS National Meeting (virtual), San Antonio, TX, April 2021
3. \*"Probing Solvent Effects on an Iodine Clock Reaction using Millifluidic Devices," (poster)  
ACS National Meeting, Washington, DC, August 2017
4. \*"Investigating Chemical Reactions using Millifluidic Devices," (poster) Assumption College Undergraduate Symposium, Worcester, MA, April 2017
5. "Unraveling the Binding Motifs of CO<sub>2</sub> in [Co(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup>, [CoO(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup> and [Cu(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup> Clusters," (poster)  
Gordon Research Conference Molecular and Ionic Clusters, Barga, Italy, April 2014
6. "Probing Solvation Effects on CO<sub>2</sub> Reduction in Metal CO<sub>2</sub> Anionic Clusters," (oral - invited)  
Gordon Research Seminar Molecular and Ionic Clusters, Barga, Italy, April 2014
7. "IR Spectroscopy of [Ag·(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup> Clusters: Reduction of CO<sub>2</sub> Mediated by Solvent Interactions," (oral)  
The Ohio State International Symposium on Spectroscopy, Columbus, OH, June 2013
8. "Infrared Spectra of [Ag·(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup>: Implications for Reductive Activation of CO<sub>2</sub>," (poster)  
Gordon Research Conference Molecular Interactions, Galveston, TX, February 2013
9. "Reductive Activation of CO<sub>2</sub> Mediated by Solvent Interactions in [Au(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup> and [Ag(CO<sub>2</sub>)<sub>n</sub>]<sup>-</sup> Clusters," (poster)  
JILA 50 Year Anniversary Celebration, Boulder, CO, June 2012
10. "IR Spectroscopy of Au<sup>-</sup>·(CO<sub>2</sub>)<sub>n</sub> Clusters: Strong Cluster Size Dependence of Metal - Ligand Interaction," (oral)  
The Ohio State International Symposium on Spectroscopy, Columbus, OH, June 2012
11. "IR Spectroscopy of Au<sup>-</sup>·(CO<sub>2</sub>)<sub>n</sub> Clusters: Strong Cluster Size Dependence of Metal - Ligand Interaction," (poster)  
Molecular and Ionic Clusters Gordon Research Conference, Ventura, CA, January 2012
12. "Vibrationally Induced Charge Transfer Reaction In CH<sub>3</sub>NO<sub>2</sub><sup>-</sup>·CH<sub>3</sub>I Clusters," (oral)  
The Ohio State International Symposium on Spectroscopy, Columbus, OH, June 2011

### **Invited Speaker:**

"Infrared Spectroscopy of Metal CO<sub>2</sub> Clusters"  
Chemistry Department Seminar  
Macalester College, St. Paul, MN

**September 17, 2014**

**Grants:**

1. Flow-3D: Software License – Funded **Spring 2021**  
Proposal for an academic research license to use the Flow-3D software for the duration of the 2021 summer for an undergraduate research project.
2. Faculty Development Grant: \$4500 – Funded **Spring 2018**  
Proposal to purchase and implement a Raman probe/spectrometer for both undergraduate research and teaching applications. Implementation was carried out in the summer of 2018.

**Students Mentored:**

1. Brian Leger '23 - Undergraduate Research/Honors Project **Summer 2021 - present**  
Worked on modeling the laminar flow dynamics and flow dynamics of the mixing region of our previously designed 3D printed millifluidic devices to better understand the nature of the flow patterns.
2. Natalia Kaczor '21 - Honors Project **Spring 2020 - Spring 2021**  
Researched the history of early dental practices for repairing dental carries (cavities), the chemistry that causes cavities, and what can be done chemically or regeneratively to restore tooth damage.
3. Mary Kate O'Shaugnessy '21 - Undergraduate Research **Summer 2018**  
Implemented a Raman spectrometer/probe setup so that Raman spectra could be measured in the millifluidic devices. Acquired preliminary data on crystal violet/hydroxide reaction to test the Raman setup.
4. Sarah Morley '18 - Undergraduate Research **Summer 2016 - Spring 2018**  
Spent two summers designing and fine tuning the millifluidic devices that are now used to perform experiments and collect data. Acquired data on the iodine clock reaction in various solvent environments that ultimately resulted in a publication with Sarah as first author.

**Service to Assumption University:**

**Undergraduate Symposium Committee - Co-Chair** **Fall 2018 - Present**

**Undergraduate Symposium Committee - Member** **Fall 2016 - Spring 2018**

In charge of organizing and holding the annual undergraduate symposium at Assumption University. Duties include (along with the co-chair Dr. Leamarie Gordon): managing the committee, soliciting projects from faculty and students, compiling and editing student abstracts, assembling the program abstract, moderating sessions during the symposium, organizing the poster session.

**Internal Review Board** **Fall 2021 - Present**

Engaged in the review of studies and experiments that involve human or other living subjects that need to meet specific ethical guidelines before they can proceed.

**Committee on Academic Integrity** **Spring 2021 - Present**

Assist in creating programs and opportunities for students and faculty to embrace and cultivate a greater sense of academic integrity in the campus community.

**Faculty Development Grant Committee** **Fall 2020 - Present**  
Participate in the review of both course load reduction and research funding grant proposals from Assumption faculty.

**Fulbright Scholarship Committee** **Fall 2019 - Present**  
An active member in discussing and improving student Fulbright applications for both teaching and research positions around the world. Contribute to the letters of recommendation that are sent with their applications and essays.

**Faculty Mentor to Assumption Science Club** **Fall 2017 - Present**  
Help to organize and direct the Assumption Science club. Conducted interviews for leadership positions, continuously helping to plan and hold events, helping guide student leaders. Have assisted in holding an on-campus event where local middle school students were able to experience Assumption science facilities first hand (spring 2019).

**Member on Various Honors Thesis Committees** **Spring 2016 - Present**  
Reading and reviewing a student honors thesis in addition to participating in the defense of the thesis. Present on committees for the following students: Emma Machado (Physics '17), Devon Joyce (Biology and Chemistry '19), Michelle Byrnes (Business '19), Brooke Mullen (Biotechnology '20), Natalia Kaczor (Chemistry '20), Emily Meyers (Business '20), Derek Girourd (Chemistry '21), Evan Kessinger (Biology '21)

**Member on Search Committees** **Fall 2018 - Present**  
Served as a contributing member on search committees to fill a tenure track faculty vacancy in Physics and a professor of practice position in Accounting.

**Summer/Transfer Advisor** **Summer 2017 - Present**  
Advise incoming first year students and transfer students on what courses they should take to pursue their desired major/academic interests.

**Representative Faculty Senate** **Fall 2018 - Spring 2020**  
One term (2 year) member of the Faculty Senate. Read numerous proposals and discussed and voted on various campus policies, committee nominations, and other aspects of faculty governance.

**Technology Advisory Committee** **Fall 2016 - Fall 2020**  
Member of advisory committee on matters of campus technology and infrastructure. Committee works closely with the Information Technology department to decide on new technological offerings in addition to voicing faculty concerns and needs to the IT department.  
Served as Chair of the committee beginning fall 2017 until committee was disbanded by the Representative Faculty Senate in fall 2020.

**Disabilities Services Committee** **Fall 2016 - Fall 2018**  
Participant in planning on campus events highlighting services on campus and opportunities for students to share their stories/experiences.

**Member of Assumption Jazz Ensemble** **Fall 2015 - Present**  
Drummer in the ensemble and mentor to students in the ensemble. Help students improve their jazz playing and model various techniques and ideas to both the other drummers and the larger ensemble. Aid in setup and tear down for all concerts and events such as the President's Dinner and the MLK Day celebration.

### Awards and Honors:

Gillman Award for Outstanding TA Leadership, University of Colorado Boulder	2010 - 2011
Graduate Teaching Excellence Award, University of Colorado Boulder	Spring 2010
Graduate Teaching Excellence Award, University of Colorado Boulder	Fall 2009

### Professional Activities and Outreach:

Manuscript Reviewer, Journal of Chemical Education	2020 - Present
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Manuscript Reviewer, Journal of Physical Chemistry A	2016 - Present
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Grant Reviewer, ACS PRF Proposal	2019 - Present
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American Chemical Society Member	2009 - Present
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Science Olympiad Event Supervisor	2016 - Present
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Supervisor for the Crime Busters event for the Massachusetts State Science Olympiad held annually at Assumption University.

CU Wizards Program	Winter 2011, 2014
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Aided in the development of a participatory science show titled "Sink or Swim" with Prof. J. Mathias Weber aimed at elementary and middle school students.

Partnership for Informal Science Education in the Community (PISEC)	2012 - 2014
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Helped design materials for and participated in weekly after school inquiry-based science experiments with middle school students who are under represented in the sciences. Worked closely with the same middle school science teacher and class for all two years.

### Technical Skills:

- Time-of-flight mass spectrometry
- Various ionization techniques (vaporization, supersonic expansion, entrainment, etc.)
- Design, use and maintenance of optical systems (lasers, non-linear optics, etc.)
- Vacuum equipment maintenance and troubleshooting
- Maintenance of custom-built lab equipment and gas-handling procedures
- Instrumental design and implementation
- General electronic practices
- General machining practices (design, milling, lathing, etc.)
- Lab safety management, waste management and chemical inventory
- Familiar with Windows, Macintosh and Linux operating systems
- Various data analysis software and word processing (Excel, Word, LaTeX, Origin, etc.)
- Density Functional Theory Calculations (Turbomole, Spartan, Gaussian)
- 3D design software (AutoCAD, etc.)