

Rachel M. **Huchmala** Hoppe

POSTDOCTORAL RESEARCH FELLOW IN COMPUTATIONAL CHEMISTRY

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Professional Positions

Postdoctoral Research Fellow

ADVISOR: PROF. VINCENT ESPOSITO

2025 - Present

Chapman University

Focus: Computational Chemistry, Dynamics of Atmospheric and Astronomical Molecules, & Spectroscopy

Postdoctoral Research Fellow

ADVISOR: PROF. BRIAN JACKSON

2023 - 2025

Boise State University

Focus: Exoplanet Transit Observations, Outreach, & Citizen Science

Discussion Section Instructor

ADVISOR: PROF. BRIAN JACKSON

Fall 2023

Boise State University

Class Supported: University Foundations 100: Alien Worlds, Alien Life

Education

University of Washington

PH.D. CHEMISTRY

2018 - 2023

Seattle, WA

- Thesis Title: Using Reduced Dimensional Models to Interpret Spectral Signatures of Large Amplitude Motions of OH Bonds
- Research Advisor: Dr. Anne McCoy

University of Washington

M.Sc. CHEMISTRY

2018 - 2020

Seattle, WA

- By Coursework | GPA: 3.52

Northern Arizona University

B.Sc. CHEMISTRY

2014 - 2018

Flagstaff, AZ

- Minors in Physics and Astronomy | GPA: 3.78
- Research co-advisors: Dr. Gerrick Lindberg and Dr. Jennifer Hanley

Publications

PEER-REVIEWED

Jackson, B.; Adams, E.R.; **Huchmala, R.M.**; Barker, M.; Rothmeier, M.; Morgenthaler, J.P.; Sickafoose, A. Metrics for Optimizing Searches for Orbital Precession from Tidal Decay via Transit- and Occultation-Timing. *AJ* **2026**, 171 103.

Huchmala, R.M.; McCoy, A.B. Using the Intensity of the OH Bend-Stretch Combination Band to Elucidate the Hydrogen Bonding Environment in Water Clusters. *J. Phys. Chem. A* **2023**, 127, 32, 6711–6721.

Finney, J.M.; Choi, T.H.; **Huchmala, R.M.**; Heindel, J.P.; Xantheas, S.S.; Jordan, K.D.; McCoy, A.B. Isotope effects in the Eigen-Zundel Isomerization of $\text{H}^+(\text{H}_2\text{O})_6$. *J. Phys. Chem. Lett.* **2023**, 14, 4666–4672.

Yang, N.; **Huchmala, R.M.**; McCoy, A.B.; Johnson, M.A. On the Character of the OH Bend-Stretch Combination Band in the Vibrational Spectra of the ‘Magic’ Number $\text{H}_3\text{O}^+(\text{H}_2\text{O})_{20}$ and $\text{D}_3\text{O}^+(\text{D}_2\text{O})_{20}$ Cluster ions. *J. Phys. Chem. Lett.* **2022**, 13, 8116–8121.

Huchmala, R.M.; McCoy, A.B. Exploring the Origins of Spectral Signatures of Strong Hydrogen Bonding in Protonated Water Clusters. *J. Phys. Chem.* **2022**, 126(8), 1360–1368.

Mitra, S.; Khuu, T.; Choi, T.H.; **Huchmala, R.M.**; Jordan, K.D.; McCoy, A.B.; Johnson, M.A. Vibrational Signatures of HNO_3 Acidity When Complexed With Microhydrated Alkali Metal Ions, $\text{M}^+ \cdot (\text{HNO}_3)(\text{H}_2\text{O})_{n=5}$

(M=Li, K, Na, Rb, Cs), at 20 K. *J. Phys. Chem. A* **2022**, 126(10), 1640-1647. *ACS Editors' Choice*

Hansen, A.S.; Bhadge, T.; Qian, Y.; Cavazos, A.; **Huchmala, R.M.**; Boyer, M.A.; Gavin-Hanner, C.F.; Klippenstein, S.J.; McCoy, A.B.; Lester, M.I. Infrared Spectroscopic signature of a hydroperoxyalkyl radical (\cdot QOOH). *J. Chem. Phys.* **2022**, 156, 014301.

Vogt, E.; **Huchmala, R.M.**; Jensen, C.V.; Boyer, M.A.; Wallberg, J.; Hansen, A.S.; Kjærsgaard, A.; Lester, M.I.; McCoy, A.B.; Kjærsgaard, H.G. Coupling of Torsion and OH-stretching in Tert-butyl Hydroperoxide. II. The OH-stretching Fundamental and Overtone Spectra. *J. Chem. Phys.* **2021**, 154, 164307.

Hansen, A.S.; **Huchmala, R.M.**; Vogt, E.; Boyer, M.A.; Bhagde, T.; Vansco, M.F.; Jensen, C.V.; Kjærsgaard, A.; Kjærsgaard, H.G.; McCoy, A.B.; Lester, M.I. Coupling of Torsion and OH-stretching in Tert-butyl Hydroperoxide. I. The Cold and Warm First OH-stretching Overtone Spectrum. *J. Chem. Phys.* **2021**, 154, 164306.

POPULAR SCIENCE ARTICLES

Huchmala, R.M.; Telescopes for Teachers. *Sky & Telescope*. **July 2025**. Cover Story

CONFERENCE PROCEEDINGS

Huchmala, R.M.; Sgro, L.; Adams, E.; Jackson, B.; et. al. SuPerPiG Observing Grid: Investigation of the HAT-P-37 System. *247th American Astronomical Society Meeting*. **2026**

Huchmala, R.M.; Carlson, D.; Kirk, A.; Jackson, B.; Adams, E. Spectrophotometric Exoplanet Transits Using Bayer-Filtered CMOS-Equipped Telescopes. *245th American Astronomical Society Meeting*. **2025**

Huchmala, R.M.; Austin, K.; Jackson, B. Telescopes for Teachers, a new program within the Central Idaho Dark Sky Reserve STEM Network. *56th AAS Division for Planetary Sciences Meeting*. Bulletin of the American Astronomical Society, **2024**, Vol. 56, No. 8.

Huchmala, R.M.; Stubbers, H.; Carlson, D.; VanLooy, H.; Jackson, B.; Adams, E.; Morgenthaler, J.; Siackafoose, A. SuPerPiG @ Boise State: Ground-Based Transit Searches for Tidal Decay. *243rd American Astronomical Society Meeting*. Bulletin of the American Astronomical Society, **2024**, Vol. 56, No. 2.

Huchmala, R.M.; McCoy, A.B. Origins of the Intensity of the Stretch-Bend Combination Transition in Water Clusters and Implications for Characterizing Hydrogen Bonding. *12th Triennial Congress of the World Association of Theoretical and Computational Chemists*. **2022**.

Huchmala, R.M.; McCoy, A.B. Origins of the Intensity of the Stretch-Bend Combination Transition in Water Clusters and Implications for Characterizing Hydrogen Bonding. *75th International Symposium of Molecular Spectroscopy*. **2022**.

Huchmala, R.M.; Boyer, M.A.; McCoy, A.B. Coupling of Torsion and OH-Stretching in Tert-Butyl Hydroperoxide and It's Radical Analog, \cdot QOOH. *International Symposium of Molecular Spectroscopy*. **2021**.

Huchmala, R.M., McCoy, A.B. Exploring the Role of Coupling in Studies of Protonated Water Clusters. *Virtual Conference on Theoretical Chemistry*. **2020**.

Huchmala, R.M.; Hanley, J.; Lindberg, G.E.; Horgan, B.N. Understanding Chlorine Salt Spectra Through Computational Methods With Implications for Martian Geochemistry. *Arizona NASA Space Grant Statewide Symposium*. **2018**.

Huchmala, R.M.; Hanley, J.; Lindberg, G.E.; Horgan, B.N. Understanding Chlorine Salt Spectra Through Computational Methods With Implications for Martian Geochemistry. *49th Lunar and Planetary Science Conference* **2018**, LPI Contrib. No. 2083.

Invited Talks

Huchmala, R.M. 2026. Citizen Science in Action in Idaho. AAS 247 Meeting: Special Session - Get Involved with NASA Citizen Science, Phoenix, AZ.

Huchmala, R.M. 2025. Panelist for Citizen Science Meeting on Astronomy. Stellar Collective, Boise, ID.

Huchmala, R.M. 2024. Illuminating the Path Less Travelled: Following Light through Chemistry & Astronomy. Boise Astronomical Society Member Meeting, Boise, ID.

Huchmala, R.M. 2024. Illuminating the Path Less Travelled: Following Light through Chemistry & Astronomy. Natural Sciences Colloquium: College of Idaho, Caldwell, ID.

Huchmala, R.M. 2023. Spectral Signatures of Hydrogen Bonding. Physics Colloquium: Boise State University, Boise, ID.

Huchmala, R.M. 2023. Using Reduced Dimensional Models to Interpret Spectral Signatures of Large Amplitude Motions. Special Seminar: California Institute of Technology, Pasadena, CA. *NSF-AGEP Research University Alliance Invited Talk*

Huchmala, R.M. 2022. Spectral Signatures of Hydrogen Bonding. Chemistry Seminar: Northern Arizona University, Flagstaff, AZ. *Alma Mater Travel Award Invited Talk*

Grants

NSF Access Discover Program

2025

REACTION PATHWAYS TO FORM CYANOBENZENE

- PI: Rachel Huchmala
- 200,000 core hours
- Equivalent to \$2,401.40

NASA Citizen Science Seed Funding Program

2024

SUPERPIG OBSERVING GRID

- PI: Rachel Huchmala
- \$63,884

Research Experience

Chapman University

2025-Present

Orange, CA

ESPOSITO LAB POSTDOCTORAL RESEARCH FELLOW

- Working to detect substituted Polycyclic Aromatic Hydrocarbons (PAHs) using spectroscopic measurements from the James Webb Space Telescope.
- Won NSF Access Allocation for extra supercomputing time.
- Mentoring undergraduate researchers in the lab.

Boise State University

2023-2025

Boise, ID

PRINCIPLE INVESTIGATOR - SUPERPIG OBSERVING GRID

- Extension of the Telescopes for Teachers Program providing an opportunity for research-grade exoplanet transit observations.
- Won NASA Citizen Science Seed Funding to support the initial year of the program (2024).
- Collaboration with NASA's Exoplanet Watch and the Unistellar Citizen Science Network.

TELESCOPES FOR TEACHERS PROGRAM LEAD

- Led effort to provide long-term loans of Unistellar robotic telescopes to K-12 teachers across the state of Idaho.
- Organized community engagement opportunities including monthly webinars and a slack workspace.
- Supported all telescope use by the participants and their students via training and online resources.

SHORT PERIOD PLANETS GROUP (SUPERPIG) RESEARCH ASSISTANT

- Mentored 11 undergraduate researchers over the course of position.
- Created an observing program for undergraduate students in physics at Boise State.
- Led efforts to collect and conduct photometric analysis on exoplanet transit data.
- Contributed to understanding of tidal decay in Ultra-Hot Jupiter exoplanets.

CENTRAL IDAHO DARK SKY RESERVE STEM NETWORK POSTDOCTORAL FELLOW

- Selected for position from a national competition.
- Trained undergraduate students in telescope use and public outreach geared for K-12 students.
- Assisted at star parties and other public engagement events around the Treasure Valley.

University of Washington

2018-2023

PHD GRADUATE RESEARCH ASSOCIATE

Seattle, WA

- Experienced in vibrational perturbation theory and density functional theory, basis sets, scaling factors, and the electronic structure package, Gaussian.
- Determined how various degrees of hydrogen bonding manifest in vibrational spectroscopy through theoretical calculations.
- Focused on reduced dimensional models aimed to capture the anharmonicities of large amplitude vibrations, conducting most work with hand-written python code.
- Participated in numerous collaborations with Dr. Mark Johnson at Yale, Dr. Marsha Lester at University of Pennsylvania and Dr. Henrik Kjærgaard at University of Copenhagen.

Northern Arizona University

2017-2018

NAU/NASA SPACE GRANT CONSORTIUM UNDERGRADUATE RESEARCHER

Flagstaff, AZ

- Used the Gaussian electronic structure package to calculate harmonic frequencies and intensities of vibrations in chlorine salt unit cells to aid in the understanding of MRO CRISM images of Columbus Crater.

Professional Development

2026	Session Chair at AAS 247 , American Astronomical Society
2025	“Hi-Res in the Desert: High Resolution Spectroscopy for Exoplanet Atmospheres” Workshop Attendance , Arizona State University
	Panelist at “Stellar Collective: A Citizen Science Conference on Astronomy” , Boise State University
	“Infrared Spectroscopy from Space: New Frontiers from Exoplanets to the Early Universe” Symposium Attendance , IPAC/Caltech
	“Sagan Summer Workshop: Exoplanet Demographics” Travel Support & Workshop Attendance , NASA Exoplanet Science Institute
	Judge for the Undergraduate Student Chambliss Award for AAS 245 , American Astronomical Society
2024	Local Organizing Committee Member for the 56th Annual DPS Meeting , American Astronomical Society - Division of Planetary Science
	“Diversifying Voices to Communicate Science” Workshop Attendance , American Association of Physics Teachers
	Judge for the Undergraduate Student Chambliss Award for AAS 243 , American Astronomical Society
2022	Research University Alliance - Research Exchange to California Institute of Technology , NSF - Alliances for Graduate Education and the Professoriate
	Alma Mater Travel Award , University of Washington

Teaching Experience

UF 100: Alien Worlds, Alien Life

Boise State University

DISCUSSION SECTION LEADER

1 Semester

- Led discussions on topics from "Becoming a Learner" by Matthew Sanders and "Strange New Worlds" by Ray Jayawardhana

Chem 152: General Chemistry II

University of Washington

LEAD TEACHING ASSISTANT

1 Quarter

- Organized and mentored other teaching assistants of the course
- Taught discussion sections and supervised laboratory
- Proctored and graded quizzes
- Held weekly office hours

Chem 153: Accelerated General Chemistry IIUniversity of Washington
2 Quarters**TEACHING ASSISTANT**

- Taught discussion sections and supervised laboratory
- Proctored and graded quizzes
- Held weekly office hours

Chem 461: Physical Chemistry LabUniversity of Washington
2 Quarters**TEACHING ASSISTANT**

- Supervised laboratory
- Assisted in interpretation and analysis of data
- Taught laboratory report best practices

Chem 142: General Chemistry IUniversity of Washington
3 Quarters**TEACHING ASSISTANT**

- Taught discussion sections and supervised laboratory
- Proctored and graded quizzes
- Held weekly office hours

Chm 151L: General Chemistry I LabNorthern Arizona University
4 Semesters**TEACHING ASSISTANT**

- Supervised laboratory
- Trained and mentored new teaching assistants
- Developed introductory content to teach students applications of vibrational spectroscopy

Awards & Fellowships

2020	National Science Foundation Graduate Research Fellowship Honorable Mention , National Science Foundation
2018	Junia E. McAlister Outstanding Senior Award , Northern Arizona University - Dept. of Chemistry & Biochemistry Kenneth Bean Teaching Award , Northern Arizona University - Dept. of Chemistry & Biochemistry
2017	Northern Arizona University/NASA Space Grant Undergraduate Research Internship , NASA Space Grant Russ B. Powell Chemistry Scholarship , Northern Arizona University - Dept. of Chemistry & Biochemistry Physical Chemistry Award , Northern Arizona University - Dept. of Chemistry & Biochemistry
2016	Nancy & Henry Wettaw Organic Chemistry Award , Northern Arizona University - Dept. of Chemistry & Biochemistry

Outreach Experience**Freelance Stargazing Associate**

2025 - Present

UNISTELLAR TELESCOPES

Southern California

- Attends local star parties and events to showcase the Unistellar robotic telescope
- Discusses space, telescopes, and light pollution with the even attendees
- Events attended:
 - Stargazing at the Skyview Los Alamos - January 2026
 - AUTRE Magazine & l.a. Eyeworks Space is the Place Event - November 2025
 - Silver Lake Star Party - October 2025
 - Silver Lake Star Party - September 2025

Telescopes for Teachers Program Lead	2023 - 2025
BOISE STATE UNIVERSITY	Boise, ID
<ul style="list-style-type: none"> • Designed and Held 4 hour workshop for teacher participants of the program • Local Media Features: <ul style="list-style-type: none"> - Boise State program provides telescopes to classrooms across Idaho - Boise State Public Radio - Idaho teachers can get a free telescope for their classroom after NASA donation to BSU - KTVB - Star light, star bright! BSU prepares dozens of telescopes for use in Boise classrooms - KIVI 	
Central Idaho Dark Sky Reserve STEM Network Postdoctoral Fellow	2023 - 2025
BOISE STATE UNIVERSITY	Boise, ID
<ul style="list-style-type: none"> • Organized and Supervised Public Viewing on Friday Nights at the Boise State Observatory. • Participated in organization of Boise State Physics' First Friday Astronomy Lecture Series. • Trained undergraduate students in scientific communication and telescope use. • Additional events attended: <ul style="list-style-type: none"> - Career Day at Wilder Middle/High School - April 2025 - Engineering Day at Riverside Elementary - March 2025 - Jefferson Elementary STEM Night - February 2025 - Stargazing for Boise State University's Parents & Family Weekend - October 2024 - Syringa Middle School Science Project Judge - May 2024 - Aerospace Day at Riverside Elementary - March 2024 - Future Jr. High visit to Boise State Physics - January 2024 - Saturn-gazing at Boise State - August 2023 - Meridian Library Mobile Planetarium Show - September 2023 - Stargazing for Boise State University's Parents & Family Weekend - October 2023 - Annular Solar Eclipse Event at Boise State University - October 2023 - Idaho Science and Aerospace Scholars Boise State Campus Visit - July 2023 - Stanley Museum Dark Sky International Information Booth - July 2023 - Stanley Star Party - July 2023 	
Chemistry Graduate Student Club President	2020 - 2022
UNIVERSITY OF WASHINGTON	Seattle, WA
<ul style="list-style-type: none"> • Helped to maintain and foster community between chemistry graduate students during the COVID-19 pandemic. • Led social events during graduate student recruitment open houses and throughout the academic year. • Served on panels for current and prospective students discussing graduate student life, work/life balance, and teaching. 	
Inclusion in Chemical Sciences Outreach Volunteer	2018 - 2023
UNIVERSITY OF WASHINGTON	Seattle, WA
<ul style="list-style-type: none"> • Set up booth events for elementary and middle school students • Helped get students engaged in STEM • Completed small science demos with the students • Events attended: <ul style="list-style-type: none"> - Echo Lake Elementary Science Night - February 2023 - Introduce a Girl to Code - September 2018 	
Lowell Observatory	2016-2018
PUBLIC PROGRAM EDUCATOR	Flagstaff, AZ
<ul style="list-style-type: none"> • Prepared and gave lectures to general audiences to engage interest in current astronomy topics. • Operated small reflecting telescopes and the historic Clark Refracting Telescope for public viewing. 	