Brian C. Ferrari

b.c.ferrari@lic.leidenuniv.nl • https://cavenfish.github.io/
https://github.com/Cavenfish

Education

Ph.D. Chemistry **2022–Present**
Leiden University, Leiden, NL

M.Sc. Physics **2019–2022**
University of Central Florida, Orlando, FL

B.S. Physics, minor in Mathematics **2014–2018**
University of Central Florida, Orlando, FL

Awards

2022
- HRSMC Conference Poster Prize

2020
- Conference Travel Award (UCF CRT52-324)

2019
- outReach for the Stars Award
- FL-AVS Short Course on Surface Science & Nano-materials 1st Place Award

2018
- Society of Physics Students Chapter Research Award
- Conference Travel Award (UCF CRT50-493)

2016
- Award for Outstanding Leadership in Physics Outreach at UCF

Professional Experience

Research History

Graduate Research Assistant **2022 – Present**
Advisor: Dr. Jörg Meyer *Leiden Institute of Chemistry*

- Quantifying the influence of cluster size for CO binding energies on solid CO
- Simulating vibrational energy relaxation in solid CO
- Calculating phonon dispersion band structure of ice Ih surface
- Characterizing how surface phonon modes influence vibrational energy relaxation of adsorbates

NASA MUREP Fellow **2020 – 2022**
Advisor: Drs. Scott Sandford & Michel Nuevo *NASA Ames Research Center*

- Collecting Raman spectra of refractory residues produced via UV irradiation of astrophysical ices
- Utilizing data science techniques to identify trends in IR and Raman spectra of refractory residues

Graduate Research Assistant **2019–2022**
Advisor: Dr. Christopher J. Bennett *University of Central Florida*

- Inducing chemical changes in astrophysical ices via keV electron irradiation
- Detecting radiation products with IR spectroscopy and mass spectrometery
- Measuring yields from electron stimulated desorption of astrophysical ices
- Utilizing quantum chemistry software to predict the spectroscopic properties of small molecules
- Utilizing density functional theory to predict the spectroscopic properties of bulk phase molecules

Undergraduate Research Assistant **2016–2018**
Advisor: Dr. Christopher J. Bennett *University of Central Florida*

- Assembling ultra-high vacuum (UHV) chamber
- Designing and machining UHV-grade sample holder and radiation shield
- Utilizing quantum chemistry software to predict the spectroscopic properties of small molecules

Employment History

Graduate Teaching Assistant **2019–2020**
Supervisor: Physics Dept. *University of Central Florida*

Undergraduate Teaching Assistant **2017–2018**
Supervisor: Physics Dept. *University of Central Florida*

Machinist Apprentice **2016–2018**
Supervisor: Robert Wong *University of Central Florida*

Leadership

Student Chapter Chairman **2019-2021**
American Vacuum Society at the University of Central Florida

External Funding

Period	Short Title	Amount
2023	LKBF Travel Support	€600.00
2020–2023	NASA MUREP Fellowship	$165,000.00
2020–2021	FSGC Dissertation Improvement Fellowship	$4,000.00
2017–2018	SPS Chapter Research Grant	$2,000.00
	Total:	$171,000.00
		€600.00

Publications

[1] **Brian C. Ferrari**, M. van Hemert, J. Meyer, and T. Lamberts. Vibrational energy relaxation in solid carbon monoxide. *The Journal of Physical Chemistry C*, 128(49):21060–21072, 2024.

[2] **Brian C. Ferrari**, G. Molpeceres, J. Kästner, Y. Aikawa, M. van Hemert, J. Meyer, and

T. Lamberts. Floating in space: How to treat the weak interaction between co molecules in interstellar ices. *ACS Earth and Space Chemistry*, 7(7):1423–1432, 2023.

[3] **Brian C. Ferrari**, K. Slavicinska, and C. J. Bennett. Role of suprathermal chemistry on the evolution of carbon oxides and organics within interstellar and cometary ices. *Accounts of Chemical Research*, pages 1181–1189, 2021.

[4] **Brian C. Ferrari** and C. J. Bennett. A computational investigation of the equilibrium geometries, energetics, vibrational frequencies, infrared intensities and raman activities of c_2o_y (y = 3, 4) species. *Molecular Physics*, page e1837404, 2020.

[5] **Brian C. Ferrari** and C. J. Bennett. A comparison of medium-sized basis sets for the prediction of geometries, vibrational frequencies, infrared intensities and raman activities for water. *Journal of Physics: Conference Series*, 1290:012013, 2019.

[6] **Brian C. Ferrari**. AutoGAMESS: A Python package for automation of GAMESS(US) Raman calculations. *Journal of Open Source Software*, 4(41):1612, 2019.

[7] R. C. Fortenberry, D. Peters, **Brian C. Ferrari**, and C. J. Bennett. Rovibrational spectral analysis of CO_3 and C_2O_3: Potential sources for O_2 observed in comet 67P/churyumov–gerasimenko. *The Astrophysical Journal*, 886(1):L10, 2019.

Conference Experience

Invited Talks

[1] **Brian C. Ferrari**, G. Molpeceres, J. Kästner, Y. Aikawa, M. van Hemert, J. Meyer, and T. Lamberts. Floating in space: How to treat the weak interaction between co molecules in interstellar ices. *Max Planck Institute for Extraterrestrial Physics Seminar*, 2024.

[2] **Brian C. Ferrari**, G. Molpeceres, J. Kästner, Y. Aikawa, M. van Hemert, J. Meyer, and T. Lamberts. Floating in space: How to treat the weak interaction between co molecules in interstellar ices. *Radboud University Nijmegen Theoretical Chemistry Seminar*, 2023.

Contributed Talks

[1] **Brian C. Ferrari**, M. van Hemert, J. Meyer, and T. Lamberts. Exploring the mysteries of co ices: Weak interactions and vibrational energy relaxation. *Presented at the Workshop on Interstellar Matter*, 2023.

[2] **Brian C. Ferrari**, K. Slavicinska, and C. J. Bennett. Electron irradiation of astrophysical ice analogues: implications for the formations of biomolecules on enceladus. *Presented at Florida Chapter of American Vacuum Society Symposium*, 2020.

Workshops

I lead two workshops at the UCF Raspberry Jam for an audience of high school, undergraduate and graduate students. Topics were taught at an introductory level and geared towards helping students learn to use Raspberry Pi micro-controllers

- **Brian C. Ferrari**. Digital Logic Circuits Workshop. *UCF Raspberry Jam*, Oct 2018.

- **Brian C. Ferrari**. Introductory Python Coding Workshop. *UCF Raspberry Jam*, Oct 2018.

Posters

[1] **Brian C. Ferrari**, M. van Hemert, J. Meyer, and T. Lamberts. Vibrational energy relaxation in solid carbon monoxide. *Poster Session of the 24th European Conference on the Dynamics of Molecular Systems*, 2024.

[2] **Brian C. Ferrari**, F. Sies, M. C. van Hemert, J. Meyer, and T. Lamberts. Vibrational energy dissipation in carbon monoxide ices: A tale of four isotopes. *Poster Session of Astrochemistry meets Surface Science: Theoretical Frontiers*, 2022.

[3] **Brian C. Ferrari**, G. Molpeceres, J. Kästner, Y. Aikawa, M. van Hemert, J. Meyer, and T. Lamberts. Floating in space: How to treat the weak interaction between co molecules in interstellar ices. *Poster Session of the Holland Research School of Molecular Chemistry Symposium*, 2022.

[4] **Brian C. Ferrari**, K. Slavicinska, and C. J. Bennett. The search for novel carbon oxides within irradiated CO_2 ices: Potential new parent species for cometary volatiles. *Poster Session of the 52nd meeting of the AAS Division of Planetary Sciences*, 2020.

[5] **Brian C. Ferrari**, N. F. Aguirre, and C. J. Bennett. Experimental study of methane fragmentation and recombination from low energy electron interactions. *Poster Session of the Florida Chapter of American Vacuum Society Symposium*, 2019.

[6] **Brian C. Ferrari** and C. J. Bennett. A comparison of medium-sized basis sets for the prediction of geometries, vibrational frequencies, infrared intensities and raman activities of water. *Poster Session of the 30th annual Conference on Computational Physics*, 2018.

Organizing

UCF AVS Astrochemistry Webinar **2020**
https://ucf.avs.org/astrochem *Webinar Series*

- Attendees from 4 continents, and over 20 different universities.
- Audience was diverse group of students, faculty, and research center scientists

UCF Raspberry Jam **2018**
Short Course

- Attendees from 3 different Florida universities and 2 industry companies
- Audience was diverse group of industry professionals, undergraduate and graduate students

Computer Skills

Programming Languages

Advanced Julia, Python, JavaScript
Intermediate C/C++, Solidity
Novice Fortran, HTML, CSS/Less

Software

∗ GAMESS(US) ∗ CP2K ∗ VMD ∗ MacMolPlt ∗ SLURM ∗ OpenMP ∗ MPI ∗ Inkscape ∗ MASsoft ∗ OMNIC ∗ LabSpec ∗ LabVIEW ∗ SolidWorks ∗ LaTeX

Teaching Assistant Experience

Course	Role	Sections
○ Physical Science	Grader	– 2
○ Physics 1 for Scientists and Engineers	Grader	– 2
○ Physics 2 for Scientists and Engineers	Studio/Scale-up TA	– 3
	Lab and Recitation Instructor	– 1
○ College Physics 1	Lab and Recitation Instructor	– 2
○ College Physics 2	Studio/Scale-up TA	– 1
	Grader	– 1
○ 'Leren Onderzoeken' 1 (Learn Research)	Supervisor	– 2
○ 'Practicum Basisvaardigheden' (Intro Chem Lab)	Apparatus Room Supervisor	– 4

Outreach Activities

Event	Role	# Times
○ STEM Day	Performed Physics "Super Powers" Demonstrations	– 5
○ Career Day	Performed Physics "Super Powers" Demonstrations	– 5

Mentoring

Undergraduate Students Mentored

Carla-Louise Chadourne (LIC), Riley Havel (UCF), Remington Cantelas (UCF), Sarah Swiersz (UCF), Gabriel Martínez (Inter PR)

Hobbies and Interest

Gardening ∗ Hiking ∗ Kayaking ∗ Bouldering ∗ Rollerblading ∗ Soccer ∗ Volleyball ∗ Running ∗ Reading