

Dr. Jacob C. Laas

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Education

- 2014 Ph.D. in Physical Chemistry
Emory University, Atlanta, GA
- 2008 B.S. in Chemistry (ACS-certified)
Pittsburg State University, Pittsburg, KS
Graduated with Departmental Academic Honors
- 2004 Southeast High School, Cherokee, KS
Graduated with Honors

Research Experience

Postdoctoral Researcher

Max-Planck-Institut für extraterrestrische Physik, DE

July 2014 – Present

Director: Prof. Dr. Paola Caselli

- Design and construction of multiple research laboratories for molecular spectroscopy of astrophysical interest.
- Equipment procurement/supplier management.
- High resolution molecular spectroscopy of ions and radicals.
- Chemical modeling (rate networks) of physically-evolving astrophysical systems.
- Design of computer software libraries for instrumentation control/programming, graphical user interfaces for laboratory experiments, and user interfaces (software libraries, GUIs, and web interfaces) for visualization/analysis of experimental data and molecular databases.
- Data management support.

Graduate Research Assistant

Emory University, GA, USA

January 2009 – May 2014

Advisor: Prof. Susanna L. Widicus Weaver

- Direct, hands-on experience conducting broadband, spectral line surveys at $\lambda = 1.3$ mm using the 10.4 m Caltech Submillimeter Observatory radio telescope (8+ weeks on-site, *ca.* 1 week remote observations).
- Design and construction of a submillimeter-wave spectrometer utilizing a pulsed supersonic gas expansion and a multipass optical cavity within a vacuum chamber to probe both photo- and HV plasma discharge-induced dissociation dynamics and spectral assignments of complex organic molecules.
- Gas/grain astrochemical modeling to probe the role of photodissociation of complex organic molecules on the relative abundances of molecules of prebiotic interest. Have also incorporated stereochemistry for the first time in an astrochemical model for the study of stereoisomerism of an interstellar molecule.
- Extensive computer scripting/programming for instrumentation control, data visualization and the reduction/manipulation of raw laboratory and observational data.
- Hands-on use of workshop tools for construction/customization of optical mounts.
- Design and construction of analog amplifiers and filters for photodetectors.

Undergraduate Research Assistant
Pittsburg State University, KS, USA

May 2008 – July 2008
Advisor: Bipin Shah

- Synthesis of fluorescent and phosphorescent dendrimers for organic light-emitting diodes.

Undergraduate Research Assistant
IBM Almaden Research Center, CA, USA

June 2007 – August 2007
Advisors: Drs. Hans Horn, Julia Rice, and William Swope

- High-level *ab initio* calculations to study an organocatalyzed ring-opening polymerization reaction in solution for the elucidation of its reaction mechanism.
- Wrote software extensions (Java) to tailor an in-house molecular viewer.

Undergraduate Research Assistant
Pittsburg State University, KS, USA

May 2006 – March 2007
Advisors: Profs. Nancy Brooker and Robert Pavlis

- Design, synthesis and characterization of dozens of small organic molecules for testing as novel anti-fungal agents.

Undergraduate Research Assistant
Pittsburg State University, KS, USA

December 2005 – May 2006
Advisor: Prof. Khamis Siam

- Design and construction of a diskless HPC beowulf cluster for use with *ab initio* quantum chemical calculations.

Undergraduate Research Assistant
Pittsburg State University, KS, USA

October 2005 – February 2006
Advisor: Prof. Robert Pavlis

- Design and synthesis of a variety of benzyl ester polymers for studying the birefringent properties of liquid crystals.
- Construction of a polarizing microscope from parts—including machining—for use in studying properties of liquid crystals.

Training and Workshop Experience

Twelfth Synthesis Imaging Workshop
Socorro, NM, USA

June 2010
Organizer: NRAO

- A week of lectures on aperture synthesis theory and techniques
- Two days of tutorials on data collection, calibration and imaging of interferometric astronomical data

IBM Summer Research Intern
IBM Almaden Research Center, San Jose, CA, USA

June 2007 – August 2007
Organizers: NSF/DOD/SJSU/IBM

- Ten weeks of training on high level *ab initio* calculations
- Weekly lectures on professional career development

Refereed Publications

- CN Shingledecker, T Lamberts, JC Laas, A Varyunin, E Herbst, J Kästner and P Caselli, “On sulfur-bearing species in interstellar ices: The effects of cosmic ray-driven radiation chemistry and non-diffusive bulk reactions,” *Astrophys. J.*, **2019**, *accepted*.
- J Laas and P Caselli, “Modeling Sulfur Depletion in Interstellar Clouds,” *Astro. & Astrophys.*, **2019**, *624*, A108, DOI:10.1051/0004-6361/201834446.
- J Chantzos, S Spezzano, C Endres, L Bizzocchi, V Lattanzi, J Laas, A Vasyunin and P Caselli, “Rotational spectroscopy of the HCCO and DCCO radicals in the millimeter and submillimeter range,” *Astro. & Astrophys.*, **2019**, *621*, A111, DOI:10.1051/0004-6361/201834419.
- V Lattanzi, S Spezzano, JC Laas, J Chantzos, L Bizzocchi, KLK Lee, MC McCarthy and Paola Caselli, “HSCO⁺ and DSCO⁺: a multi-technique approach in the laboratory for the spectroscopy of interstellar ions,” *Astro. & Astrophys.*, **2018**, *620*, A184, DOI:10.1051/0004-6361/201834340.
- L Bizzocchi, M Melosso, L Dore, CD Esposti, F Tamassia, D Prudenzano, V Lattanzi, J Laas, S Spezzano, BM Giuliano, CP Endres and P Caselli, “Accurate Laboratory Measurement of the Complete Fine Structure of the N = 1-0 Transition of ¹⁵NH,” *Astrophys. J.*, **2018**, *863*, 3 (7pp), DOI:10.3847/1538-4357/aacffc.
- D Prudenzano, J Laas, L Bizzocchi, V Lattanzi, C Endres, BM Giuliano, S Spezzano, ME Palumbo and P Caselli, “Accurate millimetre and submillimetre rest frequencies for cis- and trans-dithioformic acid, HCSSH,” *Astro. & Astrophys.*, **2018**, *612*, A56, DOI:10.1051/0004-6361/201732397.
- A Punanova, P Caselli, S Feng, A Chacón-Tanarro, C Ceccarelli, R Neri, F Fontani, I Jiménez-Serra, C Vastel, L Bizzocchi, A Pon, AI Vasyunin, S Spezzano, P Hily-Blant, L Testi, S Viti, S Yamamoto, F Alves, R Bachiller, N Balucani, E Bianchi, S Bottinelli, E Caux, R Choudhury, C Codella, F Dulieu, C Favre, J Holdship, AJ Al-Edhari, C Kahane, J Laas, B LeFloch, A López-Sepulcre, J Ospina-Zamudio, Y Oya, JE Pineda, L Podio, D Quenard, A Rimola, N Sakai, IR Sims, V Taquet, P Theulé and P Ugliengo, “Seeds of Life in Space (SOLIS). III. Zooming Into the Methanol Peak of the Prestellar Core L1544,” *Astrophys. J.*, **2018**, *855*, 112, DOI:10.3847/1538-4357/aaad09.
- C Ceccarelli, P Caselli, F Fontani, R Neri, A López-Sepulcre, C Codella, S Feng, I Jiménez-Serra, B Lefloch, JE Pineda, C Vastel, F Alves, R Bachiller, N Balucani, E Bianchi, L Bizzocchi, S Bottinelli, E Caux, A Chacón-Tanarro, R Choudhury, A Coutens, F Dulieu, C Favre, P Hily-Blant, J Holdship, C Kahane, AJ Al-Edhari, J Laas, J Ospina, Y Oya, L Podio, A Pon, A Punanova, D Quenard, A Rimola, N Sakai, IR Sims, S Spezzano, V Taquet, L Testi, P Theulé, P Ugliengo, AI Vasyunin, S Viti, L Wiesenfeld and S Yamamoto, “Seeds Of Life In Space (SOLIS): The Organic Composition Diversity at 300–1000 au Scale in Solar-type Star-forming Regions,” *Astrophys. J.*, **2017**, *850*, 176, DOI:10.3847/1538-4357/aa961d.
- L Bizzocchi, F Tamassia, J Laas, BM Giuliano, CD Esposti, L Dore, M Melosso, E Canè, AP Charmet, HSP Müller, H Spahn, A Belloche, P Caselli, KM Menten and RT Garrod, “Rotational and High-resolution Infrared Spectrum of HC3N: Global Ro-vibrational Analysis and Improved Line Catalog for Astrophysical Observations,” *Astrophys. J. Supp.*, **2017**, *233*, 11, DOI:10.3847/1538-4365/aa9571.
- F Fontani, C Ceccarelli, C Favre, P Caselli, R Neri, IR Sims, C Kahane, FO Alves, N Balucani, E Bianchi, E Caux, AJ Al-Edhari, A López-Sepulcre, JE Pineda, R Bachiller, L Bizzocchi, S Bottinelli, A Chacón-Tanarro, R Choudhury, C Codella, A Coutens, F Dulieu, S Feng, A Rimola, P Hily-Blant, J Holdship, I Jiménez-Serra, J Laas, B Lefloch, Y Oya, L Podio, A Pon, A Punanova, D Quenard, N Sakai, S Spezzano, V Taquet, L Testi, P Theulé, P Ugliengo, C Vastel, AI Vasyunin, S Viti, S Yamamoto and L Wiesenfeld, “Seeds of Life in Space (SOLIS) - I. Carbon-chain growth in the Solar-type proto-cluster OMC2-FIR4,” *Astro. & Astrophys.*, **2017**, *605*, A57, DOI:10.1051/0004-6361/201730527.
- C Codella, C Ceccarelli, P Caselli, N Balucani, V Barone, F Fontani, B Lefloch, L Podio, S Viti, S Feng, R Bachiller, E Bianchi, F Dulieu, I Jiménez-Serra, J Holdship, R Neri, JE Pineda, A Pon, I Sims, S Spezzano, AI Vasyunin, F Alves, L Bizzocchi, S Bottinelli, E Caux, A Chacón-Tanarro, R Choudhury, A Coutens, C Favre, P Hily-Blant, C Kahane, AJ Al-Edhari, J Laas, A López-Sepulcre,

- J Ospina, Y Oya, A Punanova, C Puzzarini, D Quenard, A Rimola, N Sakai, D Skouteris, V Taquet, L Testi, P Theulé, P Ugliengo, C Vastel, F Vazart, L Wiesenfeld and S Yamamoto, “Seeds of Life in Space (SOLIS) - II. Formamide in protostellar shocks: Evidence for gas-phase formation,” *Astro. & Astrophys.*, **2017**, *605*, L3, DOI:10.1051/0004-6361/201731249.
- SL Widicus Weaver, [JC Laas](#), L Zou, JA Kroll, ML Rad, BM Hays, JL Sanders, DC Lis, TN Cross, N Wehres, BA McGuire and MC Sumner, “Deep, Broadband Spectral Line Surveys of Molecule-rich Interstellar Clouds,” *Astrophys. J. Supp. Series*, **2017**, *232* (1), 3, DOI:10.3847/1538-4365/aa8098.
 - L Bizzocchi, V Lattanzi, [J Laas](#), S Spezzano, BM Giuliano, D Prudenzano, C Endres, O Sipilä and P Caselli, “Accurate sub-millimetre rest frequencies for HOCO+ and DOCO+ ions,” *Astro. & Astrophys.*, **2017**, *602*, A34, DOI:10.1051/0004-6361/201730638.
 - [JC Laas](#) and SL Widicus Weaver, “The Submillimeter Spectrum of the Methoxy Radical at Low Temperatures,” *Astrophys. J.* **2017**, *835*, 46, DOI:10.3847/1538-4357/835/1/46.
 - BM Hays, N Wehres, B Allgood DePrince, AAM Roy, [JC Laas](#) and SL Widicus Weaver, “Rotational spectral studies of O(¹D) insertion reactions with methane and ethylene: Methanol and vinyl alcohol in a supersonic expansion,” *Chem. Phys. Lett.*, **2015**, *630*, 18–26, DOI:10.1016/j.cplett.2015.04.011.
 - C Walsh, TJ Millar, H Nomura, E Herbst, S Widicus Weaver, Y Aikawa, [JC Laas](#) and AI Vasyunin, “Complex organic molecules in protoplanetary disks,” *Astron. Astrophys.*, **2014**, *563*, A33, DOI:10.1051/0004-6361/201424901.
 - [JC Laas](#), BM Hays and SL Widicus Weaver, “Multipass Millimeter/Submillimeter Spectrometer to Probe Dissociative Reaction Dynamics,” *J. Phys. Chem. A*, **2013**, *117* (39), 9548–9554, DOI:10.1021/jp3122402.
 - [JC Laas](#), RT Garrod, E Herbst and SL Widicus Weaver, “Contributions from grain surface and gas phase chemistry to the formation of methyl formate and its structural isomers,” *Astrophys. J.*, **2011**, *728* (71), 9pp, DOI:10.1088/0004-637X/728/1/71.

Conference Proceedings and Other Publications

- S Spezzano, V Lattanzi, [JC Laas](#), J Chantzou, L Bizzocchi, D Prudenzano and P Caselli, “High resolution rotational spectroscopy of elusive molecules at the Center for Astrochemical Studies (CAS@MPE),” *Proc. of: Laboratory Astrophysics: Intl. Astronomical Union Symp. 350*, **2019**, DOI:TBD.
- SL Widicus Weaver, RT Garrod, [JC Laas](#) and E Herbst, “Models of Hot Cores with Complex Molecules,” *Proc. of: The Molecule Universe: Intl. Astronomical Union Symp. 280*, **2011**, DOI:10.1017/S1743921311024884.
- [JC Laas](#), SL Widicus Weaver, RT Garrod and E Herbst, “Methanol photodissociation and its effect on complex chemistry in the ISM,” *Proc. of the 2010 NASA Laboratory Astrophysics Workshop*, **2011**, DOI:.
- NL Brooker, Y Kuzimichev, [J Laas](#) and R Pavlis, “Evaluation of Coumarin Derivatives as Anti-fungal Agents Against Soil-borne Fungal Pathogens,” *Proc. of the 59th International Symposium on Crop Protection*, **2007**, DOI:.
- NL Brooker, E Bluml, [J Laas](#) and R Pavlis, “Coumarin Derivatives as Novel Plant Protectants,” *British Crop Protection Council*, **2007**, DOI:.

Conference Presentations and Invited Talks

- [Laas, J. C.](#) and [Caselli, P.](#), “An Updated Gas/Grain Sulfur Network for Astrochemical Studies” *72nd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, **June 21, 2017**.
- [Laas, J. C.](#) and [Widicus Weaver, S.](#), “Submm Spec. of Methoxy (CH₃O) for Interstellar Searches” *71st International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, **June 21, 2016**.

- Laas, J. C. and Caselli, P., “On the Sulfur Depletion: Toward a More Complete Gas/Grain Model (poster)” *From clouds to protoplanetary disks: the astrochemical link*, Berlin, Germany, **October 4–8, 2015**.
- Laas, J. C. and Caselli, P., “Improving Gas-Grain Models of Oxygen and Sulfur (poster).” *COST Action Our Astrochemical History: First General Meeting*, Prague, Czech Republic, **May 26, 2015**.
- Laas, J. C., “Interstellar Methanol: A Complex Organic Molecule at the Crux of Many Others (talk).” *Solar System Exploration Seminar*, NASA/Goddard Space Flight Center, Greenbelt, MD, **March 5, 2014**.
- Laas, J. C., Hays, B. M., and Widicus Weaver, S. L., “A mm/submm Wave Spectrometer to Quantify Astrochemical Reaction Rates (talk).” *68th Ohio State International Symposium on Molecular Spectroscopy*, The Ohio State University, Columbus, OH, **June 19, 2013**.
- Laas, J. C. and Widicus Weaver, S. L. “Millimeter/Submillimeter Spectroscopy as a Probe of Methanol Photodissociation (poster).” *Molecular Spectrometer in the Era of Far-IR Astronomy, SELAC Workshop 2012*, Atlanta, GA, **October 28–31, 2012**.
- Laas, J. C., Garrod, R. T., Herbst, E., and Widicus Weaver, S. L. “Methanol Photodissociation as a Case Study for Probing Prebiotic Interstellar Chemistry (poster).” *Gordon Research Conference, Radiation Chemistry 2012*, Andover, NH, **July 28 – August 3, 2012**.
- Laas, J. C. and Widicus Weaver, S. L., “Methanol Photodissociation Studies using Millimeter and Submillimeter Spectroscopy (talk).” *Gordon Research Seminar, Radiation Chemistry 2012*, Andover, NH, **July 29, 2012**.
- Laas, J. C. and Widicus Weaver, S. L., “Methanol Photodissociation Studies using Millimeter and Submillimeter Spectroscopy (talk).” *67th Ohio State International Symposium on Molecular Spectroscopy*, The Ohio State University, Columbus, OH, **June 21, 2012**.
- Laas, J. C., Garrod, R. T., Herbst, E., and Widicus Weaver, S. L. “Methanol Photodissociation as a Case Study for Probing Prebiotic Interstellar Chemistry (poster).” *Astrobiology Science Conference 2012*, Atlanta, GA, **April 16, 2012**.
- Laas, J. C. and Widicus Weaver, S. L., “Laboratory Submillimeter Spectroscopy as a Probe of Methanol Photodissociation (talk).” *66th Ohio State International Symposium on Molecular Spectroscopy*, The Ohio State University, Columbus, OH, **June 22, 2011**.
- Laas, J. C. and Widicus Weaver, S. L., “Methanol photodissociation and its effects on complex chemistry in the ISM (poster).” *The Molecular Universe: Intl. Astronomical Union Symp. 280*, Toledo, Spain, **June 3, 2011**.
- Laas, J. C., Garrod, R. T., Herbst, E., and Widicus Weaver, S. L. “Methanol photodissociation and its effects on complex chemistry in the ISM (poster).” *Spectroscopy 2011, ALMA: Extending the Limits of Astrophysical Spectroscopy*, Victoria, B.C., Canada, **January 15–17 2011**.
- Laas, J. C., Garrod, R. T., Herbst, E., and Widicus Weaver, S. L., “Methanol photodissociation and its effects on complex chemistry in the ISM (poster).” *The 2010 NASA Laboratory Astrophysics Workshop*, Gatlinburg, TN, **October 25–28, 2010**.
- Laas, J. C., Widicus Weaver, S. L., and Garrod, R. T., “Methanol photodissociation branching ratios and their influence on interstellar organic chemistry (talk).” *65th Ohio State International Symposium on Molecular Spectroscopy*, The Ohio State University, Columbus, OH, **June 24, 2010**.
- Laas, J. C., Widicus Weaver, S. L., and Garrod, R. T., “Methanol photodissociation and its effects on complex chemistry in the ISM (poster).” *Dust and Ice: Their Roles in Astrophysical Environments*, University of Georgia, **March 30 – April 1, 2010**.

- Laas, J. C., Widicus Weaver, S. L., and Garrod, R. T., “Methanol photodissociation and its effects on complex chemistry in the ISM (poster).” *ACS Spring 2010 National Meeting and Exposition*, San Francisco, CA, **March 24, 2010**.
- Laas, J. C., Radhuber, M. L., Garrod, R. T., and Widicus Weaver, S. L., “Methanol Photodissociation and its Role in the Complex Chemistry of the Interstellar Medium (poster).” *2009 Center for Chemistry in the Universe Workshop*, Green Bank, WV, **May 28, 2009**.

Teaching

Emory University

- Physical Chemistry Lab (Head Teaching Assistant): Fall 2010, Spring 2011.
- General Chemistry Lab II: Spring 2009, Spring 2010.
- General Chemistry Lab I: Fall 2008, Fall 2009.
- Chemistry Tutor (private): Fall 2008 – Summer 2009.

Pittsburg State University

- Organic Chemistry Lab II: Spring 2007.
- Organic Chemistry Lab I: Fall 2006.
- Chemistry Tutor (private): Spring 2006 – Spring 2008.
- General Chemistry Lab II: Spring 2006, Spring 2008.
- General Chemistry Lab I: Fall 2005, Fall 2007.

Fellowships and Grants

- Award, Chemistry Research Quayle Fellowship, Emory University, Fall 2011
- Grant, Young Researcher Travel Grant, IAU Symposium 280, May 2010
- Award, Leon C. Heckert Research Endowment, August 2007 – May 2008
- Award, Robert T. and Thelma Horsley Plagens Scholarship, August 2007 – May 2008
- Award, Peter W. and Virginia L. Giddings Scholarship, August 2006 – May 2007

Honors and Awards

- Award, Outstanding TA Award, Emory University, Fall 2011
- Member, American Chemical Society, Fall 2008 – Spring 2011
- Honor, Dean’s Achievement List, Pittsburg State University, Fall 2004, Fall 2005 – Spring 2008
- Member, Kappa Mu Epsilon, October 2007 – May 2008
- Member, Dean’s Student Advisory Board, August 2007 – May 2008
- Member, Chemistry Club (ACS Affiliated), Pittsburg State University, August 2006 – May 2008
- Award, Analytical Chemistry Student of the Year, May 2007
- Award, 3rd Prize Undergraduate Research Poster Competition, 2006 INBRE Conference, November 2006

Skills and Qualifications

- Analytical thinking
- System design/engineering
- Molecular spectroscopy and characterization (UV/Vis, IR, Raman, microwave/mm/submm, NMR, GC/MS)
- *Ab initio* quantum chemistry (Psi4, GAMESS US, Gaussian)
- Single-dish observational radio astronomy
- Synthetic organic chemistry
- Optics: amateur astronomy, hobbyist microscopy, quasioptical mm-/submm-wave beams, laser alignment/re-tuning
- Workshop tools/machining: mill, lathe, band saw, handheld rotary tools
- Vacuum technology (high vacuum)
- Basic analog circuit design/repair and electronic interfaces
- Computer-aided design/visualization/analysis: FreeCAD, Solidworks, SYNOPSIS, ImageJ, The GIMP
- Document production: \LaTeX , Microsoft Office, LibreOffice
- Data analysis/visualization: Gnuplot, real-time plotting via PyQtGraph, computer algebra systems (Maple, Sage, MATLAB, GNU Octave)
- Programming languages: Python, Unix shell, Perl, HTML (v4/v5, PHP, CSS, JS), Java (PC, Android, Beanshell), NI LabWindows/CVI (ANSI C) C++ , Fortran (1977, 2003)
- Operating systems: Linux (Debian/Ubuntu), Microsoft Windows, Android, macOS
- Advanced computer administration/repair
- Other computing systems: user interfaces (Qt, Tk), instrumentation interfaces (device drivers, communication socket/APIs), open-source software (incl. git versioning control)
- Outdoor camping (12 years in Boy Scouts of America)
- Languages spoken: English (native), German (A1 certified, ca. B1/B2 uncertified)

Interests

- Computing
- Instrumentation/interfaces
- Data Visualization
- Travel
- Music (piano)
- Disc sports: disc golf, ultimate
- Backyard astronomy

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https://laasworld.de/storage/laas_cv.pdf