

## VITA

**NAME + TITLE** ————— Luoth “Lu” Chou  
NASA Postdoctoral Program Fellow  
NASA Goddard Space Flight Center + Georgetown University

**CONTACT** ————— luoth.chou@nasa.gov | lc1174@georgetown.edu | +1-301-286-5220  
8800 Greenbelt Road, , B34, Rm.S432, Greenbelt, MD 20771

**RESEARCH INTEREST** ————— Agnostic biosignatures detection and characterization, astrobiology of icy/ocean worlds, mission design, instrument development (mass spectrometry), data science, machine learning, and project management.

**EDUCATION** ————— **Ph.D. Earth & Environmental Sciences. 2019.** University of Illinois at Chicago.  
Dissertation: “The Organic Matter of Lake Vida, Antarctica: Biogeochemistry of an Icy Planetary World Analog”  
*Advisor:* Dr. Fabien Kenig

**B.S. Microbiology. 2013.** (Minor: Astronomy). University of Maryland, College Park.

**RESEARCH EXPERIENCE** ————— **NASA Postdoctoral Program (NPP) Fellow.** NASA Goddard + Georgetown University **2019 - present**  
Universities Space Research Association (USRA)  
“Agnostic biosignatures detection using mass spectrometry”  
*Advisors:* Dr. Paul Mahaffy & Dr. Sarah S. Johnson

**Graduate Researcher.** University of Illinois at Chicago **2013 - 2019**  
“The metabolomics, metagenomics, and geochemistry of the brine of Lake Vida (Antarctica)”  
*Advisor:* Dr. Fabien Kenig

**Undergraduate Research Intern.** U.S. Food and Drug Administration **2011 - 2013**  
Joint Institute for Food Safety and Applied Nutrition (JIFSAN) Internship Program  
“The molecular genetics of *Listeria monocytogenes*, a food-borne pathogen, under cold and salinity stress”  
*Advisor:* Dr. Atin Datta

**AWARDS + FELLOWSHIPS** ————— NASA Postdoctoral Program Fellowship. USRA. **March 2020 - present**  
NASA Early Career Collaboration Award. \*declined **Fall 2018**  
NASA Earth and Space Science Fellowship (NESSF). **\$116,114.** **Fall 2016 - Spring 2019**  
Chancellor’s Graduate Research Fellowship. University of Illinois at Chicago. **\$8,000.** **Summer 2015-16**  
On To the Future Travel Award. Geological Society of America. **\$500.** **Fall 2015**  
LAS PhD Travel Award. University of Illinois at Chicago. **\$250.** **Fall 2015**  
Bodmer Science International Travel Award. University of Illinois at Chicago. **\$750.** **Summer 2015**  
Outstanding Teaching Assistant Award. National Association of Geoscience Teachers. **Spring 2015**  
Graduate Research Fellowship. Illinois Space Grant Consortium (ISGC). **\$10,000.** **Fall 2014**  
The Colonnade Society Undergraduate Scholarship. U of MD Alumni Association. **\$2,000.** **Fall 2012**  
The College of Computer, Mathematical, and Natural Sciences Scholarship. U of MD. **\$2,000.** **Spring 2012**  
The Sam Walton Scholarship. **\$3,000.** **Fall 2009**

**PROFESSIONAL ACTIVITIES** ————— **NASA Review Panel**, *Group Chief, Panelist, Executive Secretary* **2014, 2018(x2), 2019, 2020**  
**Network for Life Detection (NfoLD) Early Career Council**, *Lead Team Member* **February 2020 - present**  
**Santa Fe Institute** (2 weeks), *Visiting Scientist* **November 2019**  
**NASA Jet Propulsion Laboratory Planetary Science Summer Seminar** (11 weeks) **Summer 2017**  
> *Project Manager* for a mission design exercise for a Centaur Reconnaissance Mission.  
**The History and Philosophy of Astrobiology Summer School** (1 week), *Participant* **Summer 2015**  
**Josep Comas i Solà International Summer School in Astrobiology** (1 week), *Participant* **Summer 2014**  
**Smithsonian Institution** (12 weeks), *Intern* **Summer 2010**

**PEER-REVIEWED PUBLICATIONS** – KEY: #under review, \*in press, ^in preparation (manuscript available upon request)

#**Luoth Chou**, Murray A., Kenig, F., Organic sulfones in the brine of Lake Vida (Antarctica). *Geochimica et Cosmochimica Acta*

^**Luoth Chou**, Murray A., Kenig F., Metagenomic Evidence for Lipid Legacy: the Brine of Lake Vida, Antarctica

^**Luoth Chou**, Griza R., Kenig F., Organic Geochemical Analysis of Lake Vida Ice Core Sediment Layers: A biogeochemical Record of Past Environmental Conditions

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1. Carrier, B.L., and the Mars Extant Life Consortium (including **Luoth Chou** as a Sub-Team lead). Mars Extant Life: What's Next? Conference Report. *Astrobiology*, 20(6). [doi.org/10.1089/ast.2020.223](https://doi.org/10.1089/ast.2020.223)

2. Kenig, F., **Luoth Chou.**, Wardrop, D.J. (2019) Comment on "Evaluation of the Tenax trap in the Sample Analysis at Mars instrument suite on the Curiosity rover as a potential hydrocarbon source for chlorinated organics detected in Gale Crater" by Miller et al. 2015. *JGR: Planets*, 124(2). [doi.org/10.1029/2018JE005606](https://doi.org/10.1029/2018JE005606)

3. Howell, S., **Luoth Chou**, Thompson, M., Bouchard, M., Cusson, S., Marcus, M., Smith, H., Bhattaru, S., Blalock, J., Brueshaber, S., Eggl, S., Jawin, E., Miller, K., Rizzo, M., Steakley, K., Thomas, N., Trent, K., Ugelow, M., Budney, C. and Mitchell K. (2018) Camilla: A centaur reconnaissance and impact mission concept. *Planetary and Space Science* 164, 184-193. [doi.org/10.1016/j.pss.2018.07.008](https://doi.org/10.1016/j.pss.2018.07.008)

**4. Luoth Chou**, Kenig, F., Murray, A., Doran, P., Fritsen C., (2018) Effects of legacy metabolites from previous ecosystems on the environmental metabolomics of the brine of Lake Vida, East Antarctica. *Organic Geochemistry* 122, 161-170. [doi:10.1016/j.orggeochem.2018.05.002](https://doi.org/10.1016/j.orggeochem.2018.05.002)

5. Stelmach, K., Neveu, M., Vick-Majors, T., Mickol, R., **Luoth Chou**, Webster, K., Tilley, M., Zacchei, F., Escudero, C., Flores-Martinez, C., Labrado, A., Fernandez, E., (2018) Secondary Electrons as a Novel Energy Source: Implications for Life on Icy Worlds. *Astrobiology* 18 (1), 73-85. [doi:10.1089/ast.2016.1510](https://doi.org/10.1089/ast.2016.1510)

6. Kenig, F., **Luoth Chou**, McKay, C., Jackson, A. W., Doran, P., Murray, A., Fritsen C. (2016) Perchlorate and volatiles of the brine of Lake Vida (Antarctica): Implication for the in situ analysis of Mars sediments. *Journal of Geophysical Research: Planets*, 121(7), [doi:10.1002/2015JE004964](https://doi.org/10.1002/2015JE004964)

7. L.S. Burall, A. C. Simpson, **Luoth Chou**, P. Laksanalamai, A. R. Datta, (2015) A novel gene, IstC, of *Listeria monocytogenes* is implicated in high salt tolerance, *Food Microbiology* 48, 72-82, [doi:10.1016/j.fm.2014.12.008](https://doi.org/10.1016/j.fm.2014.12.008)

**NON-REFEREED PAPERS** – KEY: Lead author(s)

**Luoth Chou**, Natalie Grefenstette, Sarah S. Johnson, Heather Graham, Paul Mahaffy, Christopher Kempes, Jamie E. Elsila, Eric Libby, Andrew Ellington, Eric Anslyn, Tori Hoehler, Peter Girguis, Leroy Cronin, William Brinkerhoff, Barbara Sherwood Lollar, "**Towards a more universal life detection strategy**". NASEM, Planetary Science & Astrobiology Decadal Survey White Paper (2020).

Bethany P. Theiling, William Brinckerhoff, Julie Castillo-Rogez, **Luoth Chou**, Victoria Da Poian, Heather Graham, Sona S. Hosseini, Eric Lyness, James MacKinnon, Marc Neveu, Kaizad Raimalwala, Barbara Thompson "**Non-Robotic Science Autonomy Development**". NASEM, Planetary Science & Astrobiology Decadal Survey White Paper (2020).

Heather Graham, Katherine Freeman, **Luoth Chou**, Joseph M. Pasterski "**An Appeal for Improved Sample Selection, Preparation and Interpretation Standards for Organic Biosignature Experiments Performed by Flight Instrumentation**". NASEM, Planetary Science & Astrobiology Decadal Survey White Paper (2020).

Carol Stoker, Jennifer G. Blank, Penelope Boston, **Luoth Chou**, Shiladitya DasSarma, Jennifer Eigenbrode, Natalie Grefenstette, Diana Northup, Andrew Schuerger, Dirk Schulze-Makuch, Vlada Stamenković, Jesse Tarnas. "**We Should Search for Extant Life on Mars in this Decade**". NASEM, Planetary Science & Astrobiology Decadal Survey White Paper (2020).

**CONFERENCES — AGU 2020 Session Organizer.** Planetary Science.  
**ORGANIZATION** “Detecting life through space and time: from geochemistry to biology”

**CONFERENCES +** KEY: \*\*oral presentation  
**ABSTRACTS**

**\*\*Luoth Chou**, Da Poian, V., Kempes, C., Graham, H., Kempes, C., Johnson, S.S., Mahaffy, P., Fricke, GM., (2020) Agnostic Polymer Detection in Astrobiological Samples Using Mass Spectrometry and Data-driven Analysis. [Goldschmidt 2020](#). (Virtual)

Da Poian, V., **Luoth Chou**, Grefenstette, N.M., Graham, H., Kempes, C., Mahaffy, P., Johnson, S.S. (2020) Agnostic Polymer Detection Using Mass Spectrometry for Astrobiological Samples. [American Society for Mass Spectrometry Conference Reboot 2020](#). (Virtual)

**Luoth Chou**, Grefenstette, N.M., Da Poian, V., Kempes, C., Graham, H., Roussel, A., Mahaffy, P., Johnson, S.S., (2020) Agnostic Polymer Detection Using Mass Spectrometry for Astrobiological Samples. [51th Lunar and Planetary Science Conference 2020](#). The Woodlands, Texas. LPI Contribution No. 2706.

Johnson, S.S., Graham, H., Anslyn, E., Conrad P., Cronin L., Ellington, A., Elsilá J., Girguis, P., House, C., Libby, E., Mahaffy, P., Sherwood Lollar, B., Steele, A., **Luoth Chou**, Grefenstette N., Da Poian, V., (2019) Agnostic Approaches to Extant Life Detection. [Mars Extant Life: What's Next?](#). Carlsbad, NM. LPI Contribution No. 2108.

**\*\*Luoth Chou**, A. E. Murray, F. Kenig (2019). The nature of legacy biosignatures in cold-limited, slow-growing ecosystems. [Astrobiology Science Conference 2019](#). Bellevue, WA. Paper 411-8.

A. E. Murray, **Luoth Chou**, F. Kenig, C. H. Fritsen, P. T. Doran. (2018). Forecasting Habitability Through the Ice-Sealed Lens of Antarctica's Lake Vida. [American Geophysical Union 2018](#), Washington, D. C.

**Luoth Chou** and F. Kenig (2018). Legacy metabolites and organic matter preservation in an Antarctic cryoencapsulated hypersaline brine. [Astrobiology Graduate Conference 2018](#), Atlanta, GA.

M.C. Bouchard, S.M. Howell, **Luoth Chou**, et al. (2018). Flyby and Impact of Chariklo: A New Frontiers Class Centaur Reconnaissance Mission Concept from the 2017 NASA-JPL Planetary Science Summer Seminar. [49th Lunar and Planetary Science Conference 2018](#). The Woodlands, Texas. LPI Contribution No. 2083, id.2087.

**Luoth Chou**, F. Kenig, W. A. Jackson (2017). Strategies for facilitating organic matter detection in subsurface perchlorate-rich brines of Earth and Mars. [American Geophysical Union 2017](#), New Orleans, LA.

**Luoth Chou**, Howell S., et al. (2017) Centaur Reconnaissance Mission: a NASA JPL Planetary Science Summer Seminar mission design experience. [American Geophysical Union 2017](#), New Orleans, LA.

**\*\*Luoth Chou**, F. Kenig, W. A. Jackson (2017). Perchlorate Removal From the Brine of Lake Vida for Volatile Organic Matter Analysis in a Mars Analog. [Astrobiology Science Conference 2017](#), Mesa, AZ.

**\*\*Luoth Chou**, F. Kenig, A. E. Murray, C. H. Fritsen, P.T. Doran (2016). GC x GC-TOF MS of metabolites of Lake Vida brine (Antarctica). [American Geophysical Union 2016](#), San Francisco, CA.

**\*\*Luoth Chou**, The 2015 International Geobiology Course, et al. (2015). Coupled Stratigraphy, Petrography, and  $\delta^{47}$  of Ancient Walker Lake, Nevada Reveals Unique Analog for Studying Proterozoic Stromatolite Formation and Climatic Forcings. [Geological Society of America 2015](#), Baltimore, MD.

L. A. Zinke, J. Buongiorno, **Luoth Chou**, L. M. van Maldegem, et al. (2015). Couple geochemical and microbiological characterization of non-carbonate firmgrounds from a modern soda lake, Walker Lake, Nevada. [Geological Society of America 2015](#), Baltimore, MD.

**Luoth Chou**, F. Kenig, A. E. Murray, P.T. Doran, C. H. Fritsen (2015). The Metabolomics of the Brine of Lake Vida (McMurdo Dry Valleys, Antarctica). [American Geophysical Union 2015](#), San Francisco, CA.

**Luoth Chou**, F. Kenig, A. E. Murray, P.T. Doran, C. H. Fritsen (2015). The Lipidomics of the Brine of Lake Vida (McMurdo Dry Valleys, Antarctica). [Astrobiology Science Conference 2015](#). Chicago, IL.

## TEACHING EXPERIENCE

**Teaching Assistant.** University of Illinois at Chicago. **Fall 2013 - Spring 2016**  
Global Environmental Change. Earth, Energy, & Environment. Stats. Methods in Earth & Environmental Science

**Teaching Assistant.** Princeton University (John Hopkins Center for Talented Youth) **Summer 2013**  
Epidemiology.

**Teaching Assistant.** University of Maryland, College Park. **Fall 2012 , Spring 2013**  
Principles of Microbiology.

## FIELD EXPERIENCE

**Biosignatures and the Search for Life on Mars Summer School** (2 weeks) **Summer 2016**  
Iceland (sample collection, analysis, geochemical characterization, ATP assay for biosignature detection)

**The International Geobiology Course** (5 weeks) **Summer 2015**  
California, Nevada, and Catalina Island (Sample preparation and field collection. Geochemical, petrographic, clumped isotope, and microbiological analyses, and paleoenvironmental reconstruction of Walker Lake, NV).

## INVITED LECTURES

**“Astrobiology:** in search of who’s out there by looking at who we are.” (2016) UIC Biology Colloquium

**“Environmental Geochemistry:** Introduction to Organic Geochemistry.” (2017) UIC Department of Earth and Environmental Sciences.

**“Agnostic Biosignatures Detection** using Mass Spectrometry” (2020) Solar System Exploration Division Science Seminar for the Director. NASA Goddard Space Flight Center.

## TECHNICAL SKILLS

### Organic Chemistry

Gas chromatography (GC), pyrolysis-GC  
Mass spectrometry (MS)  
Multidimensional GC×GC-TOF-MS  
Solid-phase microextraction (SPME)  
Laser Desorption Ionization (LDI)-MS  
Ion exchange chromatography (IX)  
GC-Flame Ionization Detector (GC-FID)  
Organic matter extraction

### Molecular Biology

Growth Cultures Assays  
CFU Study  
DNA Extraction, PCR  
Spectrophotometry  
DNA cloning  
Bacterial transformation

### Programming & Software

Python, R, Qiime, NCBI, BLAST+  
ChemStation, ChromaTOF, XCalibur  
Adobe Illustrator, InDesign, Photoshop  
Geographic Information System (ArcGIS)

## OUTREACH ACTIVITIES

**Visits to Chicago Montessori School** (Chicago, IL) to speak about geology. **April 2016, 2017, 2019**  
Co-create lesson plans and in-class demonstrations of geology, and planetary science.

**Visit to Brentano Math and Science Academy** (Chicago, IL) to speak about Earth science. **December 2018**

**SAGANet.org. Monthly newsletter organizer** and **Astrobiology “expert”**. **August 2018 - present**

**AbGradCon Outreach Event.** “An Evening of Wonder – Life and Art on Earth and Beyond”  
Volunteered as an astrobiologist to speak with the general public at Georgia Tech University **June 2018**

**Social Media Organizer** and **Science Marshal.** **February to April, 2017**  
Part of the organizing group for the March for Science at Chicago event. On April 22nd, 2017, approximately 60,000+ people attended the march.

**UIC Today.** “Marching for Science” Interview for article on The March for Science. **April 2017**  
<https://today.uic.edu/marching-for-science>





**Interview on The Show About Science.** **April 2017**  
A children’s podcast hosted by 6-years-old Nate Butkus. Episode title: Marching for Science and Extraterrestrials.

**(Honest) Conversations With (Real) Scientists.** Hosted by Jimmy Dagger and Joey Pasterski. **June 2017**  
Invited to speak on panel about life in the universe and astrobiology. Cafe Mustache, Chicago.

**PROFESSIONAL AFFILIATIONS** — American Geophysical Union  
National Association of Geoscience Teachers  
Geological Society of America

**PEER REVIEWER** — *Astrobiology, Open Astronomy*

**STUDENTS MENTORED** — Ulysse Prieto (Feb 2020 - present)  
Ruxandra Griza (Jan 2019 - August 2019)  
Kevin Englebert (April 2017 - March 2019)  
Elizabeth Zagorski (Jan 2016 - Dec 2016)

**SOCIAL** —  [www.astrobio.lu](http://www.astrobio.lu)     [@astrobiophile](https://twitter.com/astrobiophile)     [/luothchou](https://www.linkedin.com/company/luothchou)     [astrobiophile](https://github.com/astrobiophile)