

Claire Zurkowski

Affiliation and Contact

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Education

2021 **The University of Chicago**, Chicago, IL
Ph.D., Geophysical Sciences
2016 **San Francisco State University**, San Francisco, CA
B.S., Geology

Research Interests

I am an experimental mineral physicist interested in the structural stability and thermodynamics of materials at high pressures and temperatures. My work is performed multimegabar pressures and high temperatures— conditions related to the deepest interiors of Earth and planetary bodies. I specialize in synchrotron powder and single-crystal X-ray diffraction techniques in the laser-heated diamond anvil cell and sample recovery and chemical analysis using the focused ion beam and electron microscopy. The novel compounds and phase relations that I have discovered have significant implications ranging from finding new framework structures for potential large-cation storage to identifying phases that may dictate the density structures of planetary mantles and cores.

Publications **Zurkowski C.C.**, Lavina B., Chariton S., Greenberg E., Tkachev S. N., Prakapenka, V.B., and Campbell A. J. (2020). The novel high-pressure/high-temperature compound Co_{12}P_7 determined from synchrotron data. *Acta Crystallographica E* 76, 1665-1668. <https://doi.org/10.1107/S2056989020012657>

Publications in Press

Zurkowski C.C., Lavina B., Chariton S., Greenberg E., Prakapenka V.B., and Campbell A.J. The crystal structure of Fe_2S at 90 GPa based on single-crystal X-ray diffraction techniques. *American Mineralogist*, in press. <https://doi.org/10.2138/am-2022-7973>

Zurkowski C.C., Lavina, B., Brauser, N. M., Davis, A. H., Chariton, S., Tkachev, S., Greenberg, E., Prakapenka, V. B., and Campbell, A. J. Pressure-induced $C23-C37$ transition and compression behavior of orthorhombic Fe_2S to Earth's core pressures and high temperatures. *American Mineralogist*, in press. <https://doi.org/10.2138/am-2022-8187>

Submitted Publications

Zurkowski C.C., Lavina B., Case A., Swadba K., Chariton S., Prakapenka V.B., and Campbell A.J. Fe_5S_2 identified as a host for sulfur in Earth and planetary cores. Submitted to *Earth and Planetary Science Letters*. Preprint: <https://doi.org/10.31223/X5H337>

Zurkowski C.C., Lavina B., Chariton S., Prakapenka V.B., and Campbell A.J. Stability

of Fe₂S and Fe₁₂S₇ to 125 GPa– implications for S-rich planetary cores. Submitted to *Geochemical Perspectives Letters*.

Publications in Preparation (*sent to coauthors*)

Zurkowski C.C., Lavina B., Case A., Chariton S., Tkachev S., Prakapenka V.B., and Campbell A.J. Decomposition of Fe₃P and structural stability of Fe₅P₂ to 70 GPa and 2700 K. Prepared to submit to *Journal of Geophysical Research: Planets*.

Zurkowski C.C., Yang J., Chariton S., Prakapenka V.B., and Fei Y. Synthesis of an eight-coordinated Fe₃O₄ high-pressure phase: Implications for the mantle structure of super-Earths. Prepared to submit to *Earth and Planetary Science Letters*.

Scholarships and Awards

2021	Advances in synchrotron-based research towards understanding the structure, evolution, and dynamics of Earth and planetary interiors workshop postdoc participation award, Advanced Photon Source
2020	Arts, Science + Culture Initiative graduate collaboration grant awarded
2019	Student Presentation Award, COMPRES Annual Meeting
2018	Student Presentation Award, COMPRES Annual Meeting
2018–2021	NSF Graduate Research Fellowship
2017	Outstanding Student Paper Award, Mineral and Rock Physics, AGU Fall Meeting
2016–2021	McCormick Fellowship, University of Chicago
2016	Department Honoree, San Francisco State University's Geology Department
2016	Summa Cum Laude, San Francisco State University
2013–2016	Dean's List San Francisco State University
2013	Presidential Scholarship, Pratt Institute
2013	Valedictorian, The John Carroll School
2013	Judith Resnick Scholarship for Women in the Math and Sciences
2013	William J. Sacco Scholarship for Applied Mathematics
2013	Math, Physics and Art Student of the Year, The John Carroll School

Invited Talks

2021	Carnegie Institution for Science , Experimental Petrology and Mineral Physics Group, <i>High P-T multigrain synthesis and the importance of powder and single crystal X-ray diffraction techniques</i>
2021	Carnegie Institution for Science , Experimental Petrology and Mineral Physics Group, <i>Investigating the structural properties of Fe-rich sulfides to Earth's core pressures and high temperatures</i>

Conference Presentations

Zurkowski, C.C., Lavina, B., Case A., Swadba K., Chariton, S., Prakapenka V.B., and Campbell A.J. (2021) Synthesis and characterization of a new complex iron sulfide at Earth's outer core conditions. Abstract DI35D-0062 presented at 2021 meeting, AGU, 12-17 Dec. (Poster Presentation)

Zurkowski, C.C., Lavina, B., Chariton, S., Greenberg E., Prakapenka V.B., and Campbell A.J. (2020) Phase stability and structural properties of Fe₂S and its analog Co₂P at high pressures and temperatures. Abstract EGU21-1862 presented at 2021 meeting, EGU, 26 Apr. (Oral Presentation)

Zurkowski, C.C., Lavina, B., Chariton, S., Greenberg E., Prakapenka V.B., and Campbell A.J. (2020) Phase stability and structural properties of Fe₂S and its analog Co₂P at high

pressures and temperatures. Abstract MR024-05 presented at 2020 meeting, AGU, 1-17 Dec. (Oral Presentation)

Zurkowski, C.C., Davis, A.H., Chariton, S., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2020) A hexagonal Fe₃S phase at Earth's core conditions. Abstract. COMPRES Annual Meeting (Oral Presentation)

Zurkowski, C.C., Brauser, N.M., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2019) Phase stability and thermal equations of state of Fe₃S and Fe₂S polymorphs to Earth's core pressures and high temperatures. Abstract D113A-05 presented at 2019 meeting, AGU, Washington, D.C., 9-13 Dec. (Oral Presentation)

Zurkowski, C.C., Brauser, N.M., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2019) Phase stability and thermal equations of state of Fe₃S and Fe₂S polymorphs to Earth's core pressures and high temperatures. Abstract. COMPRES Annual Meeting (Poster Presentation)

Zurkowski, C.C., Chidester, B.A., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2018). Phase relations in the Fe–S–O system to Earth and planetary core conditions. Abstract MR42A-02 presented at 2018 meeting, AGU, Washington, D.C., 10-14 Dec. (Oral Presentation)

Zurkowski, C.C., Chidester, B.A., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2018). Stability of the high pressure phase Fe₃(S,O)₂ to Earth and planetary core conditions in the Fe–S–O system Abstract. *COMPRES Annual Meeting*. (Oral Presentation).

Zurkowski, C.C., Chidester, B.A., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2018). Stability of the high pressure phase Fe₃(S,O)₂ to Earth and planetary core conditions in the Fe–S–O system. Abstract. *COMPRES Annual Meeting*. (Poster Presentation).

Zurkowski, C.C., Chidester, B.A., Davis, A.H., Brauser, N.M., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2017). Stability of the high pressure phases Fe₃S₂ and Fe₂S to Earth's core pressures in the Fe–S–O and Fe–S–O–Si systems. Abstract MR54A-07 presented at 2017 meeting, AGU, New Orleans, Louisiana, 10-15 Dec. (Oral Presentation).

Brennan, M, **Zurkowski, C.C.**, Chidester, B.A., Campbell, A.J. (2017) Deep-Earth equilibration between molten iron and solid silicates. Abstract MR43C-0483 presented at 2017 meeting, AGU, New Orleans, Louisiana, 10-15 Dec. (Poster Presentation).

Zurkowski, C.C., Chidester, B.A., Davis, A.H., Brauser, N.M., Greenberg, E., Prakapenka, V.B. and Campbell, A.J. (2017) Stability of the high pressure phase Fe₃S₂ up to 175 GPa in the Fe–S–O system. Abstract. *COMPRES Annual Meeting*. (Poster Presentation)

Professional Experience

Current **Postdoctoral Fellow**, Carnegie Institution for Science
working with Yingwei Fei

Jan-19–Mar 19	Teaching Assistant , University of Chicago Department of Geophysical Sciences <i>Mineralogy</i>
May-18–present	Laboratory of Mineral Physics , University of Chicago <i>PhD candidate</i> Advisor: Dr. Andrew Campbell
Jan-15–Jun-16	High Temperature Geochemistry Research Group , San Francisco State University <i>Geochemistry Field and Research Assistant</i> Advisor: Dr. Mary Leech
Jan-15–Jun-15	United States Geological Society , Menlo Park <i>Geophysics Research Assistant</i> Advisor: Dr. Walter Mooney
Jan-14–Jan-15	The Isotope Geochemistry Laboratory , University of Maryland <i>Geochemistry Research Assistant</i> Advisors: Dr. Roberta Rudnick and Dr. William McDonough

Instrumentation and Analysis Experience

Diamond anvil cell

symmetric, short symmetric, BX90

Diamonds

brilliant-type diamonds, boehler-almx-type diamonds and seats

Synchrotron radiated powder and single-crystal X-ray diffraction

Sector 13 ID-D and BM-D, GSECARS of the Advanced Photon Source, Argonne National Laboratory.

Multi-anvil press

8/3 large assembly at Fei's High Pressure Lab, Earth and Planets Laboratory, Carnegie Institution for Science

Chemical Analysis

TESCAN LYRA3 field-emission SEM and FIB at the University of Chicgao; FEI Helios PFIB G4, Zeiss Auriga SEM, JEOL JXA-8530F field emission EMPA at the Earth and Planets Laboratory, Carnegie Institution for Science

Analysis

Dioplas, CrysAlisPro, Shelxt/Shelxl, GSAS-II, Vesta, Jana, Python, R, Julia, Excel, Photoshoph, Illustrator

Funded Experimental Proposals

2021	Argonne National Lab, Sector 13 BM-D, GSECARS <i>Single-crystal X-ray diffraction investigations into the P-T-X thermodynamics of minerals recovered in diamond inclusions and shocked meteorites</i>
2021	Argonne National Lab, Sector 13 ID-D, GSECARS <i>Phase stabilities of iron oxides and the polymorphism of Fe_3O_4 to Earth's core-mantle boundary conditions</i>
2020	Argonne National Lab, Sector 13 ID-D, GSECARS <i>Fe_2S polymorphism and Fe-S phase relations at Earth's core conditions</i>
2020	Argonne National Lab, Sector 13 BM-D, GSECARS <i>Crystallographic investigations into the high pressure-temperature polymorphism of M_2X compounds ($M = Mg, Cr, Mn, Fe, Co, Ni$; $X = Si, S, P$) as analogs for Fe,Ni- rich sulfides, phosphides and silicides in planetary cores</i>
2020	Argonne National Lab, Sector 13 BM-D, GSECARS <i>Examining the high P-T Fe-P phase relations with multigrain diffraction as an analog for Fe-S in Earth's core</i>

2020 **Argonne National Lab, Sector 13 BM-D, GSECARS**
Single crystal and multigrain diffraction studies of the Fe₂S polymorphs and their structural analogs

Outreach

2021 **Advanced Photon Source High-Pressure Workshop**
 Crystallography session chair

2020 **UChicago Department of the Physical Sciences Conduct Committee**
 Committee member

2020 **Notre**
 Art-science interview

2020 **Space Us**
 Art-science interview

2019 **UChicago News**
 Art-science interview

2019 **AGU Mineral and Rock Physics**
 Twitter account manager

2019 **ArtSciInitiative**
 Instagram account manager

2018 **COMPRES Student Planning Committee**
 Vice Chair

2019 **AGU Mineral and Rock Physics Planning Committee**
 Student Representative

2018 **COMPRES Student Planning Committee**
 Committee member

2018 **UChicago Women in Graduate Science Student Leadership Team**
 Geophysical sciences representative

2018 **UChicago Physical Sciences Division Dean's Student Advisory Committee**
 Geophysical sciences representative

2017 **Field Museum Outreach**
 Docent

2017 **Marillac Social Center**
 Math and science tutor

2016 **UChicago Lab Tours**
 Featured speaker and tour guide

2016 **Chicago Upward Bound Tutoring Program**
 Math and science tutor

2016 **Argonne National Lab's Hour of Code Initiative**
 Classroom assistant at Peck Elementary School

2016 **Mentor Matching Engine Chicago**
 Mentor

Washington DC, 6 February 2022