

Dr. Angela K. Boysen
(she/her)

Simons Foundation Postdoctoral Fellow

Department of Geophysical Science

University of Chicago

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EDUCATION

- 2020** **PhD in Chemical Oceanography**
University of Washington. Advised by Dr. Anitra Ingalls.
Thesis: Marine microbial metabolomics: a journey through time, space, and metabolism
- 2017** **Masters in Chemical Oceanography.**
University of Washington. Advised by Dr. Anitra Ingalls.
Thesis: Marine metabolomics: overcoming analytical challenges to reveal microbial community dynamics.
- 2011** **Bachelor of Science in Chemistry** with Distinction.
Stanford University. Advised by Dr. Chris Chidsey.

RESEARCH EXPERIENCE AND POSITIONS HELD

- 2021 – Present** **Postdoctoral Scholar**, *Department of Geophysical Sciences, University of Chicago, Chicago, IL.* Advised by Dr. Jacob Waldbauer
- 2021** **Lecturer**, *School of Oceanography, University of Washington, Seattle, WA.*
- 2014 – 2020** **Graduate Research Fellow**, *School of Oceanography, University of Washington, Seattle, WA.* Advised by Dr. Anitra Ingalls.
- 2011** **Intern**, *Nutritional Ecology Lab, Smithsonian Environmental Research Center.* Advised by Dr. Olav Oftedal.
- 2010** **Summer Student Fellow**, *Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution.* Advised by Dr. Elizabeth Kujawinski.
- 2009** **Undergraduate Research Fellow**, *Energy Resources Engineering Department, Stanford University.* Advised by Dr. Jennifer Wilcox.

TEACHING EXPERIENCE

- 2021** **Instructor**, Ocean 295: Marine Organic Chemistry, Winter quarter, *University of Washington.*
- 2020** **Instructor**, Ocean 295: Marine Organic Chemistry, Winter quarter, *University of Washington.* (Co-taught with 2 other instructors)
- 2019** **Guest Lecture**, Ocean 520: Marine Chemistry, *University of Washington*
- 2019** **Instructor**, Environmental Science. Math Science Upward Bound, Summer, *University of Washington.* (Course development and implementation)
- 2018** **Curriculum development**, Ocean 330: Biogeochemical Cycles, *University of Washington*
- 2016 – 2018** **Curriculum development and implementation**, *Jane Addams Middle School, Seattle, WA,* Units on ocean sensor building and data analysis, harmful algal blooms and climate change, fish kills in hood canal.
- 2017** **Teaching Assistant**, Ocean 330: Biogeochemical Cycles, Spring quarter, *University of Washington*
- 2016** **Teaching Assistant**, Ocean 295: Marine Organic Chemistry, Winter quarter, *University of Washington*
- 2012 – 2013** **Outdoor Science Instructor**, *Oregon Museum of Science and Industry*

AWARDS AND FELLOWSHIPS

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|--------------------|---|
| 2021–2023 | Simons Foundation Postdoctoral Fellow of Marine Microbial Ecology (\$261,000.00 over 3 years) |
| 2016 – 2020 | National Science Foundation Graduate Research Fellow (3 years of full funding) |
| 2019 | Meeting & Travel Award , UW College of the Environment |
| 2019 | Best Student Poster , 2019 Marine Particles and Phycospheres Conference |
| 2017 | McManus Teaching Award Honorable Mention , UW Oceanography |
| 2015 | Center for Microbial Oceanography: Research and Education Summer Course Student |
| 2014 – 2016 | National Science Foundation IGERT Fellow . <i>Program on Ocean Change</i> , <i>University of Washington</i> (2 years of full funding) |
| 2014 – 2017 | ARCS Foundation Graduate Fellow (\$17,500 over three years) |
| 2011 | Phi Beta Kappa |

PUBLICATIONS (* INDICATES EQUAL CONTRIBUTION)

IN REVIEW OR IN PREP

Angela K. Boysen; Carlson, L.T.; Aylward, F.; Durham, B.P.; Groussman, R.; Ribalet, F.; K.R. Heal; White, A.E.; DeLong, E.; Armbrust, E.V.; Ingalls, A.E., Particulate Metabolites and Transcripts Reflect Diel Oscillations of Microbial Activity in the Surface Ocean. Accepted at *mSystems*. Preprint on bioRxiv. doi: 10.1101/2020.05.09.086173

Katherine R. Heal, Durham, B.P; **Boysen, A.K.**; Carlson, L.T.; Qin, W.; Ribalet, F.; White, A.E.; Bundy, R.M.; Armbrust, E.V.; Ingalls, A.E. Marine community metabolomes carry fingerprints of phytoplankton community composition. Accepted at *mSystems*. Preprint on bioRxiv. doi: 10.1101/2020.12.22.424086

Daniel Muratore*; **Angela K. Boysen***; Matthew Harke*; Becker, K.; Casey, J.; Coesel, S.; Mende, D.; Wilson, S.; Aylward, F.O.; Eppley, J.M.; Vislova, A.; Peng, S.; Rodriguez, R.; Beckett, S.J.; Armbrust, E.V.; DeLong, E.; Karl, D.M.; White, A.; Zehr, J.; Van Mooy, B.; Dyhrman, S.; Ingalls, A.E.; Weitz, J., Diel Cycling in Marine Microbial Metabolism from Taxa to Community Scales. In revision for *Nature Ecology and Evolution*. Preprint on bioRxiv. doi: 10.1101/2020.05.15.098020

Bryndan Durham; **Boysen, A.K.**; Heal, K.R.; Carlson, L.T.; Boccamazzo, R.; Deodato, C.; Qin, W.; Cattolico, R.A.; Ingalls, A.E.; Armbrust, E.V. Chemotaxonomic patterns in intracellular metabolites of marine microbial plankton. In preparation.

Angela K. Boysen; Heal, K.R.; Carlson, L.T.; Ingalls, A.E. Glycine betaine uptake and use in marine microbial communities. In preparation.

PUBLISHED

Hannah M. Dawson; Heal, K.R.; **Boysen, A.K.**; Carlson, L.T.; Ingalls, A.E.; Young, J.N. (2020) Potential of temperature and salinity-driven shifts in diatom compatible solute concentrations to impact biogeochemical cycling within sea ice. *Elementa: Science of the Anthropocene*, 8(1).

McLachlan, R.; Bolden, I.; **Boysen, A.**; Baker, C. “Harmful Algal Blooms” *Climate Science for the Classroom* edited by Bertram and Biyani, 2019. <https://uw.pressbooks.pub/climate/>.

Samuel T. Wilson*; Nicholas J. Hawco*; Armbrust, E.V.; Barone, B.; Björkman, K.M.; **Boysen, A K.**; Burgos, M.; Burrell, T.J.; Casey, J.R.; DeLong, E.F.; Dugenne, M.; Dutkiewicz, S.; Dyhrman, S.T.; Ferrón, S.; Follows, M.J.; Foreman, R.K.; Funkey, C.P.; Harke, M.J.; Henke, B.A.; Hill, C.N.; Hynes,

A.M.; Ingalls, A.E.; Jahn, O.; Kelly, R.L.; Knapp, A.N.; Letelier, R.M.; Ribalet, F.; Shimabukuro, E.M.; Tabata, R.K.S.; Turk-Kubo, K.A.; White, A.E.; Zehr, J.P.; John, S.; Karl, D.M. (2019) Kīlauea lava fuels phytoplankton bloom in the North Pacific Ocean. *Science*, 365(6457), 1040-1044.

Bryndan Durham; **Boysen, A.K.**; Carlson, L.T.; Groussman, R.; Heal, K.R.; Cain, K.; Morales, R.; Coesel, S.; Morris, R.; Ingalls, A.; Armbrust, E.V. (2019) Sulfonate-based networks between eukaryotic phytoplankton and heterotrophic bacteria in the surface ocean. *Nature Microbiology*, 1-10.

Angela K. Boysen*; Katherine Heal*; Carlson, L.T.; Ingalls, A.E. (2018) Best-Matched Internal Standard Normalization in Liquid Chromatography–Mass Spectrometry Metabolomics Applied to Environmental Samples. *Analytical chemistry*, 90 (2), 1363-1369.

Elizabeth B. Kujawinski; Kido Soule, M.C.; Valentine, D.L.; **Boysen, A.K.**; Longnecker, K.; Redmond, M.C. (2011) Fate of Dispersants Associated with the Deepwater Horizon Oil Spill, *Environ. Sci. Technol.*, 45 (4), 1298-1306.

PRESENTATIONS (PRESENTING AUTHOR IN BOLD)

Angela K. Boysen, K.R. Heal, M.R. Gradoville, N. Hawco, B.P. Durham, R.D. Groussman, L.T. Carlson, P. Pinedo-Gonzalez, F. Ribalet, J.P. Zehr, R.M. Bundy, S. John, E.V. Armbrust, and A.E. Ingalls. Assessing community metabolism and flexibility: metabolomics and microbial diversity across the North Pacific Transition Zone and in response to nutrient amendments. Talk presented at the 2020 Ocean Sciences Meeting, February 17-21; San Diego, CA.

Katherine Heal, A.K. Boysen, B.P. Durham, L.T. Carlson, E.V. Armbrust, A.E. Ingalls, R.M. Bundy. Chemical and genetic evidence point to arsenic-metabolites underpinning the marine arsenic cycle. Talk presented at the 2020 Ocean Sciences Meeting, February 17-21; San Diego, CA.

Sarah Ellen Johnston, J. Collins, A.K. Boysen, C. Soued, D.E. Butman, K. Wickland, S. Sadro, A.E. Ingalls, B. Bergamaschi, L. Windham-Myers, M. Bogard. Planktonic respiration and organic matter cycling using short-term in situ measurements. Poster presented at American Geophysical Union 2019 Fall Meeting, December 9-13; San Francisco, CA.

Angela K. Boysen, Microbial community metabolism in the North Pacific Transition Zone: insights from metabolomics and nutrient amendment experiments. *University of Washington*. Chemical oceanography seminar. Nov 22, 2019.

Angela K. Boysen; Bolden, I.W.; Baker, C.; McLachlan, R. A phenomenon based climate science curriculum for middle-school classrooms: Harmful Algal Blooms, Society, and Climate Change. Poster presented at the Earth Educators' Rendezvous. July 15-19, 2019; Nashville, TN.

Angela K. Boysen; Heal, K. R.; Carlson, L. T.; Ingalls, A. Clues into microbial community and activity: particulate metabolites change over the diel cycle and across a natural oceanographic gradient in the North Pacific. Poster presented at the Marine Particles and Phycospheres Conference. May 19-23, 2019; Ascona, Switzerland.

Matt Bogard; Collins, J.; Boysen, A.K.; Wickland, K.; Sadro, S.; Johnston, S.E.; Ingalls, A.E.; Windham-Myers, L.; Bergamaschi, B.; Striegl, R.G.; Dornblaser, M.; Spencer, R.; Butman, D.E. Exploring planktonic respiration using short-term in situ measurements. Talk presented at the 2019 Society for Freshwater Society annual meeting. May 19-23; Salt Lake City, UT.

Bryndan P. Durham; Boysen, A.K.; Carlson, L.T.; Groussman, R.D.; Heal, K.R.; Cain, K.R.; Morales, R.L.; Morris, R.M.; Ingalls, A.E.; Armbrust, E.V. The sulfonate cycle; a new trophic link between ocean

plankton. Poster presented at the 2018 Marine Microbes Gordon Research Conference, July 1-6; Lucca, Italy.

Angela K. Boysen; Heal, K.R.; Durham, B.P.; Carlson, L.T.; Armbrust, E.V.; Ingalls, A. A metabolomic survey of marine microbes. Poster presented at the 2018 Annual Conference of the Metabolomics Society. June 24-28; Seattle, WA.

Katherine R. Heal; Carlson, L.T.; Boysen, A.K.; Durham, B.P.; Armbrust, E.V.; Ingalls, A.E. Metabolite pools in the marine microbiome across a basin-wide oceanographic gradient in the North Pacific. Poster presented at the 2018 Annual Conference of the Metabolomics Society. June 24-28; Seattle, WA.

Hannah M. Dawson; Boysen, A.K.; Heal, K.R.; Carlson, L.T.; Ingalls, A.E.; Young, J.N., Metabolic response of sea-ice diatoms to shifting temperature and salinity. Poster presented at the Polar 2018 Conference. June 15-26; Davos, Switzerland.

Angela K. Boysen; Aylward, F.; Durham, B.P.; Carlson, L.T.; Armbrust, E.V.; DeLong, E.; Ingalls, A.E. Diel Patterns in Intracellular Metabolite Pools of the North Pacific Subtropical Gyre Microbial Community Show Linkages Between Gene Expression and Community Activity. Talk presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Hannah M. Dawson; Boysen, A.K.; Heal, K.R.; Carlson, L.T.; Ingalls, A.E.; Young, J.N. Characterization of compatible solute use in a cultured sea-ice alga, *Nitzschia lecontei*, and in the environmental algal community of Utqiagvik [Barrow], AK using a metabolomics approach. Poster presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Bryndan P. Durham; Groussman, R.; Boysen, A.K.; Heal, K.R.; Carlson, L. T.; Morales, R.; Coesel, S.; Ingalls, A. E.; Armbrust, E. V. Trophic exchange between eukaryotic phytoplankton and bacterial taxa revealed through metabolomics and transcriptomics. Poster presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Bryndan P. Durham; Carlson, L. T.; Boysen, A.K.; Heal, K.R.; Groussman, R.; Morales, R.; Ingalls, A. E.; Armbrust, E. V. Novel organosulfur metabolism in eukaryotic phytoplankton revealed through combined 'omics approaches. Talk presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Katherine R. Heal; Carlson, L.T.; Boysen, A.K.; Durham, B.P.; Kellogg, N.A.; Lionheart, R.; Armbrust, E.V.; Ingalls, A.E. Metabolite pools across a basin-wide oceanographic gradient in the North Pacific. Poster presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Angela K. Boysen; Carlson, L.; Aylward, F.; Durham, B.; Delong, E.; Armbrust, E.V.; Ingalls, A. Integrating metabolite and transcript data to study diel cycles of activity in the North Pacific Subtropical Gyre. Poster presented at the 2017 Chemical Oceanography Gordon Research Conference. July 23-28; New London, NH.

Angela K. Boysen; Carlson, L.; Aylward, F.; Durham, B.; Delong, E.; Armbrust, E.V.; Ingalls, A.E. Integrating metabolite and transcript data to study diel cycles of activity in the North Pacific Subtropical Gyre. Talk presented at the 2017 Chemical Oceanography Gordon Research Seminar. July 22-23; New London, NH.

Angela K. Boysen, Marine metabolomics: overcoming analytical challenges to reveal microbial community dynamics. *University of Washington*. Special chemical oceanography seminar. May 10, 2017.

Angela K. Boysen; Carlson, L.; Wied, A.; Lionheart, R.; Ingalls, A. Diel Patterns in Cellular Metabolites Reflect Marine Microbial Interactions. Poster presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Bryndan P. Durham; Boysen, A.K.; Carlson, L. T.; Ingalls, A. E.; Armbrust, E. V.; Sulfonate Cycling and Signaling Between Marine Phytoplankton and Heterotrophic Bacteria. Talk presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Katherine R. Heal; Carlson, L. T.; Boysen, A. K.; Lionheart, R. M.; Kellogg, N. A.; Ingalls, A. E.; Metabolic Consequences of Cobalamin Starvation in Marine Microbes Revealed Through Metabolomics. Talk presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Angela K. Boysen; Carlson, L.; Ingalls, A. Insights into the diel cycles of marine microbes through metabolomics. Poster presented at the 2016 Graduate Climate Conference. Oct 28- 30; Pack Forest, WA.

Angela K. Boysen; Carlson, L.; Hmelo, L.; Ingalls, A. Analysis of Particulate and Dissolved Metabolite Pools at Station ALOHA. Poster presented at the 2016 Ocean Sciences Meeting. Feb 22-26; New Orleans, LA.

Yina Liu; Boysen, A.K.; Kujawinski, E.B. Characterization and fate of crude oil derived water-soluble polar organic components in seawater. Poster presented at the 2014 Gulf of Mexico Oil Spill & Ecosystem Science Conference. January 26-29; Mobile, AL.

Olav Oftedal; **Ralls, K.**; Tinker, T.; Staedler, M.; Boysen, A.K. Can Fatty Acids Be Used to Determine Diet in Seat Otters? Talk presented at the Southern Sea Otter Research Update Meeting, Feb 9, 2012. Santa Cruz, CA.

Angela K. Boysen; Kujawinski, E. B. Mass Spectral Analysis of Water Column Samples from a Single Depth Profile Near the Deepwater Horizon Oil Spill. Poster presented at the American Geophysical Union, Fall Meeting 2010. Dec 13-17; San Francisco, CA.

Angela K. Boysen; Carlson, L.; Wied, A.; Lionheart, R.; Ingalls, A.E. Diel Patterns in Cellular Metabolites Reflect Marine Microbial Interactions. Poster presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Ariel Atkins; **Angela K. Boysen**; Wilcox, J. On the Prevention of Trace Metal Emissions from Coal Combustion. Poster presented at the Student Poster Session. American Institute of Chemical Engineers 2009 Annual Meeting. Nov 7-13; Nashville, TN.

RESEARCH CRUISE EXPERIENCE

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| 2019 | Gradients 3.0 Cruise , Honolulu, HI on R/V Kilo Moana, 21 days |
| 2018 | HOT-LAVA Cruise , Hilo, HI to Honolulu, HI on R/V Ka'imikai-O-Kanaloa, 5 days |
| 2017 | Gradients 2.0 Cruise , Honolulu, HI on R/V M.G. Langseth, 18 days |
| 2015 | SCOPE/C-MORE HOE Legacy Cruise , Honolulu, HI on R/V Kilo Moana, 13 days |
| 2015 | C-MORE Summer Course Cruise , Honolulu, HI on R/V Kilo Moana, 8 days |
| 2014 | Hood Canal, WA on R/V <i>Barnes</i> , 1 day |
| 2012 | Cascadia Initiative Cruise, Leg 6 , Newport, OR on R/V <i>Oceanus</i> , 11 days |

PROFESSIONAL MEMBERSHIP

2015 – Present Member of the American Society for Limnology and Oceanography.
2018 – 2019 Member of the National Association of Geoscience Teachers.

2018 Member of the Metabolomics Society.

UNIVERSITY AND ACADEMIC SERVICE

2019 – 2020 UW School of Oceanography Committee on Diversity, Equity, and Inclusion
2017 – 2019 UW College of the Environment Committee on Diversity, Equity, and Inclusion
2016 – 2019 Organizing Committee for the Hedges Visiting Scholar Program, University of Washington
2018 Search Committee for the Director of the UW Marine Biology Major
2016 Organizing Committee Member of the Graduate Climate Conference, Fundraising Chair
2016 Chair of Biogeochemistry Session at the Graduate Climate Conference, Pack Forest, WA
2016 Co-chair of the University of Washington's School of Oceanography All Student Educational Retreat
2015 Organizing Committee for the IGERT speaker series, Winter quarter, University of Washington, Seattle, WA
Ad hoc Reviewer for *Limnology and Oceanography*, *Limnology and Oceanography: Methods, Applied and Environmental Microbiology*

WORKSHOPS AND ACTIVITIES

Dec 7-10, 2020 Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Poster presenter. Online.
Jul-Aug, 2020 PR²ISM workshop series on equity-minded practices for STEM instruction and research. Participant. University of Washington, Seattle, WA.
Dec 9-12, 2019 Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Panel discussion participant, Poster presenter. New York, NY.
Oct 15-17, 2019 Simons Collaboration Gradients Program Workshop, Participant. Seattle, WA.
Jul 18-19, 2019 Broadening Participation in the Geosciences, Earth Educators' Rendezvous, Participant. TSU, Nashville, KY.
Jul 15-17, 2019 Preparing for an Academic Career. Earth Educators' Rendezvous, Participant. TSU, Nashville, KY.
Jun 10, 2019 Microaggressions Workshop. UW College of the Environment, Participant. Seattle, WA.
Jun 13-15, 2018 Modeling ALOHA with Hierarchical Analysis of the Light-driven Ocean workshops, Participant. Georgia Tech, Atlanta, GA.
Oct 29-31, 2018 Modeling ALOHA with Hierarchical Analysis of the Light-driven Ocean workshops, Participant. University of Washington, Seattle, WA.
Dec 4-6, 2017 Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Poster presenter. New York, NY.
Sep 13-15, 2017 UW Program on Climate Change Summer Institute, "Climate Change and Population Health", Participant. Friday Harbor Labs, WA.
Apr 4, 2017 UW Research Computing eScience Institute Cloud 101 Workshop, Participant. Seattle, WA.
Dec 5-7, 2016 Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Poster presenter. New York, NY.
Nov 18, 2016 UW College of the Environment Science Communication Workshop, Participant. Seattle, WA.
Sep 14-16, 2016 UW Program on Climate Change Summer Institute, "The Climate of Antarctica and the Southern Ocean", Participant. Friday Harbor Labs, WA.
Jul 11-15, 2016 Summer Institute in Statistics for Big Data. Participant. UW Department of Biostatistics, Seattle, WA.
Oct 16-18, 2015 UW IGERT Program on Ocean Change Workshop, Participant. Friday Harbor Labs, WA.
May 26 – Jun 26, 2015 Center for Microbial Oceanography: Research and Education Summer Course, "Microbial Oceanography: Genomes to Biomes", Student. Honolulu, HI.

Jan 15-16, 2015 UW eScience Software Carpentry Workshop, Participant. Seattle, WA.
Oct 10-12, 2014 UW IGERT Program on Ocean Change Workshop, Participant. Pack Forest, WA.

OUTREACH

2014 – 2020 Team lead and trip leader, Sierra Club Inspiring Connections Outdoors, Seattle, WA.
2018 Mentor for a high school intern, Pacific Science Center Discovery Corps, Seattle, WA.
2018 Guest judge for AP Environmental Science geoengineering project presentations, Lake Sammamish High School, Bellevue, WA.
2017 - 2018 Science Communication Fellow at the Pacific Science Center, Seattle, WA.
2017 Guest Instructor at Launch Learning at Highland Park Elementary School, Seattle, WA.
2015 Volunteer instructor, Ocean Inquiry Project, Seattle, WA.
2015 Volunteer instructor, HiveBIO Community Labs, Seattle, WA.
2015 Regional ORCA Bowl Volunteer, National Ocean Science Bowl, Seattle, WA.