Dr. Alexi Christina Besser

Postdoctoral Research Scholar
School of Earth and Space Exploration
Arizona State University – Tempe, AZ
acbesser@asu.edu
Google Scholar | ResearchGate | ORCID

Education

2022 **Doctor of Philosophy in Biology with Distinction**
University of New Mexico – College of Arts and Sciences (Albuquerque, NM)
Primary advisor: Dr. Seth Newsome

2017 **Bachelor of Science in Earth Sciences**
University of Minnesota – College of Science and Engineering (Minneapolis, MN)

Bachelor of Science (Major: Ecology, Evolution & Behavior; Minor: Plant Biology)
University of Minnesota – College of Biological Sciences (Minneapolis, MN)

Professional Appointments

2023 – **Adjunct Research Assistant Professor**
University of New Mexico – Department of Biology (Albuquerque, NM)

2023 – **Postdoctoral Research Scholar**
Arizona State University – School of Earth and Space Exploration (Tempe, AZ)
Primary advisor: Dr. Elizabeth Trembath-Reichert

2018 – 2022 **National Science Foundation Graduate Research Fellow**
University of New Mexico – Department of Biology (Albuquerque, NM)

2017 – 2022 **Graduate Research and Teaching Assistant**
University of New Mexico – Department of Biology (Albuquerque, NM)

2017 **Field and Lab Technician in Dr. Jacques Finlay's Aquatic Ecology Lab**
University of Minnesota – Department of Ecology, Evolution & Behavior (St. Paul, MN)

2016 – 2017 **Student Technician in Molecular Diagnostics Lab**
University of Minnesota – Veterinary Diagnostic Lab (St. Paul, MN)

2014 – 2016 **Field and Lab Technician in Dr. David Fox's Paleoecology Stable Isotope Lab**
University of Minnesota – Department of Earth Sciences (Minneapolis, MN)

Peer-Reviewed Publications

* indicates a student mentee author

9. Robinson, A. L.*, Elliott Smith, E. A., **Besser, A. C.**, Newsome, S. D. 2024. Tissue-specific carbon isotope discrimination and amino acid metabolism in southern sea otters. *Oecologia*. doi: 10.1007/s00442-023-05505-8

8. Shipley, O. N., McMeans, B. C., **Besser, A. C.**, Bloomfield, E., Newsome, S. D. 2023. Energy channeling and varying food-chain length promote nutritional diversity in a northern lake predator. *Freshwater Biology*, 68(10), 1660–1672. doi: 10.1111/fwb.14148

7. Turner, T. F., Bart, H. L. Jr., McCormick, F. H., **Besser, A. C.**, Bowes, R. E., Capps, K. A., DeArmon, E. S., Dillman, C. B., Driscoll, K. P., Dugger, A., Hamilton, G. L., Harris, P. M., Hendrickson, D. A., Hoffman, J., Knouft, J. H., Lepak, R. F., López-Fernández, H., Montaña, C. G., Newsome, S. D., Pease, A. A., Smith, W. L., Taylor, C. A., Welicky, R. L. 2023. Long-term ecological research in freshwaters enabled by regional biodiversity collections, stable isotope analysis, and environmental informatics. *BioScience*, 73(7), 479–493. doi: 10.1093/biosci/biad039

6. **Besser, A. C.**, Manlick, P. J., Blevins, C. M.*, Takacs-Vesbach, C. D., Newsome, S. D. 2023. Amino acid isotope analysis reveals variation in the gut microbial contribution to protein metabolism among trophic levels in a wild small mammal community. *Ecology Letters*, 26, 1359–1369. doi: 10.1111/ele.14246

5. Coletto, J. L., **Besser, A. C.**, Botta, S., Madureira, L. S. P., Newsome, S. D. 2022. Multi-proxy approach for studying a migratory marine consumer's feeding ecology and trophic position in the southwestern Atlantic Ocean. *Marine Ecology Progress Series*, 690, 147–163. doi: 10.3354/meps14036

4. **Besser, A. C.**, Elliott Smith, E. A., Newsome, S. D. 2022. Assessing the potential of amino acid $\delta^{13}C$ and $\delta^{15}N$ analysis in terrestrial and freshwater ecosystems. *Journal of Ecology*, 110, 935–950. doi: 10.1111/1365-2745.13853

3. Ramirez, M. D., **Besser, A. C.**, Newsome, S. D., McMahon, K. W. 2021. Meta-analysis of primary producer amino acid $\delta^{15}N$ values and their influence on trophic position estimation. *Methods in Ecology and Evolution*, 12, 1750–1767. doi: 10.1111/2041-210X.13678

2. Dombrosky, J., **Besser, A. C.**, Elliott Smith, E. A., Conrad, C., Pagès Barceló, L., Newsome, S. D. 2020. Resource risk and stability in the zooarchaeological record: the case of Pueblo fishing in the Middle Rio Grande, New Mexico. *Archaeological and Anthropological Sciences*, 12(248). doi: 10.1007/s12520-020-01193-0

1. Whiteman, J. P., Elliott Smith, E. A., **Besser, A. C.**, Newsome, S. D. 2019. A guide to using compound-specific stable isotope analysis to study the fates of molecules in organisms and ecosystems. *Diversity*, 11(8). doi: 10.3390/d11010008

Manuscripts in Preparation and Review

* indicates a student mentee author; Δ indicates both authors contributed equally and share first-authorship

3. Wall, Christopher B.Δ, **Besser, A. C.Δ**, Symons, C. C., Newsome, S. D., Shurin, J. B. *Submitted*. Zooplankton reliance on autochthonous and allochthonous resources across alpine lakes assessed with essential amino acid $\delta^{13}C$ analysis. *Limnology & Oceanography Letters*.

2. Lappan, R., Thakar, J., Molares Moncayo, L., **Besser, A. C.**, Bradley, J., Goordial, J., Trembath-Reichert, E., Greening, C. *In Preparation*. The atmosphere as a living, breathing microbial ecosystem. *The ISME Journal*.

2. **Besser, A. C.**, Robinson, A. L.*, Turner, T. F., Takacs-Vesbach, C. D., Newsome, S. D. *In Preparation*. Differential utilization of submerged leaf litter by microbial biofilms and macroinvertebrates in the Middle Rio Grande: insights from mesocosm and field experiments. *Limnology & Oceanography*.

Fellowships and Grants

Pending — *National Science Foundation BIO IOS – Integrative Ecological Physiology:* "Linking Gut Microbiota to Host Nutrient Dynamics, Immunity, and Survival in a Resource-Limited Ecosystem"
Senior Personnel with Co-PIs Drs. Seth Newsome, Cristina Takacs-Vesbach, Robin Warne, Justin Yeakel
($1,524,836)

2018 – 2022 — *National Science Foundation Graduate Research Fellowship*: "The role of heterotrophic biofilms in transferring terrestrially-derived energy into the Rio Grande food web" ($138,000)

2018 – 2021 — University of New Mexico Department of Biology Scholarships: *Melinda Bealmer Memorial Scholarship, Crawford Rio Grande Graduate Scholarship, Alvin R. and Caroline G. Grove Summer Research Scholarship, Biology Graduate Student Association Research Award, and Biology Graduate Student Association Travel Award*
($11,068)

2017 – 2018 — *University of New Mexico Regents' Winrock Fellowship*
($10,000)

Total Funds Awarded: $159,068

Teaching Experience

2023 — **Guest Lecturer for GLG 470/598: Hydrogeology**
Arizona State University – School of Earth and Space Exploration
This guest lecture covered the basics of stable isotope analysis, including a chemistry refresher, definitions, and an introduction to isotopic fractionation, delta notation, and

stable hydrogen and oxygen isotopes in the water cycle.

2021 – 2022 **Laboratory Instructor for IsoCamp (isocamp.org)**
University of New Mexico – Center for Stable Isotopes
This two-week short course provides hands-on training in the use of stable isotopes in the natural sciences. The amino acid stable isotope analysis laboratory project aims to teach students the basics of sample preparation and analysis using a GC-C-IRMS system, as well as the biochemical framework behind essential amino acid carbon isotope fingerprinting and amino acid nitrogen trophic position estimation.

2021 **Co-Instructor for BIOL 409/509: Elemental Ecology**
University of New Mexico – Department of Biology
This course is designed to help students develop the background knowledge and technical skills needed to implement stable isotope analysis into their research. Lectures address theory and applications of stable isotopes as tracers of important physiological, ecological, and environmental processes. Laboratory exercises focus on practical skills including chemical preparation, sample weighing, instrumentation, statistical analysis, and writing. Students gain hands-on experience through a semester-long group project in which they collect, prepare, and analyze their own samples.

2017 **Teaching Assistant for BIOL 201: Cellular and Molecular Biology**
University of New Mexico – Department of Biology
This biology core course addresses topics such as the scientific method, the role of water in cell biology, the main macromolecules found in living organisms, cell structures and functions, cellular respiration, photosynthesis, cell signaling, and the cell cycle.

Mentorship and Training

I have trained over a dozen graduate students, postdoctoral researchers, and visiting scientists in amino acid stable isotope analysis. Training includes preparation of samples, day-to-day operation of analytical instruments, instrument troubleshooting, repair, and maintenance, data correction, and statistical analysis.

2023 – Anejelique Martinez (mentor)
M.S. (Biology), anticipated May 2025
University of New Mexico – Department of Biology

2023 – Austin Murrell (secondary honors thesis advisor)
B.S. (Conservation Biology and Ecology), anticipated May 2024
Arizona State University – Barrett Honors College

2020 – 2022 Alana Robinson (honors thesis co-mentor)
B.S. (Biochemistry and Molecular Biology), May 2022
University of New Mexico – Center for Stable Isotopes

2018 – 2020 Vishwa Patel (mentor)
B.S. (Environmental Science), May 2020
University of New Mexico – Center for Stable Isotopes

2019 Everett Meredith (co-mentor)
NSF REU, Summer 2019
University of New Mexico – Sevilleta Field Station

2017 – 2018 Christina Blevins (mentor)
B.S. (Biology), May 2018
University of New Mexico – Department of Biology

Invited Presentations

* indicates a student mentee author

Besser, A. C. Tracing the movement of essential macromolecules through food webs using stable isotopes. Center for Ecosystem Science and Society Seminar, Northern Arizona University, Flagstaff, AZ, November 2023.

Besser, A. C., Manlick, P. J., Blevins, C. M.*, Takacs-Vesbach, C. D., Newsome, S. D. Variation in gut microbial contribution of essential amino acids to host protein metabolism in a wild small mammal community. *Animal foraging, food webs, and nutrition: linkages revealed using stable isotopes*, The Wildlife Society's 30th Annual Conference, Louisville, KY, November 2023.

Contributed Conference Presentations

* indicates a student mentee author

Besser, A. C., Lima-Zaloumis, J., Throop, H., Trembath-Reichert, E. Life in the sky: investigating microbial ecology and activity in Earth's atmosphere. Research Insights in Semiarid Ecosystems Symposium, Tucson, AZ, October 2023. Poster.

Besser, A. C., Trembath-Reichert, E. Life in the sky: Characterizing microbial genomes and proteomes in Earth's atmosphere. School of Earth and Space Exploration Symposium, Tempe, AZ, August 2023. Talk.

Besser, A. C., Trembath-Reichert, E. Life in the sky: Characterizing microbial genomes and proteomes in Earth's atmosphere. Extreme Biophysics and Biology Research Coordination Network Conference, La Jolla, CA, April 2023. Poster.

Robinson, A. L.*, Elliott Smith, E. A., **Besser, A. C.**, Tinker, T. M., Newsome, S. D. Amino acid metabolism in southern sea otters. The Society for Integrative and Comparative Biology Conference, Austin, TX, January 2023. Talk.

McMahon, K. W., Ramirez, M. D., **Besser, A. C.**, McCarthy, M. D., Newsome, S. D. Embracing variability in amino acid $\delta^{15}N$ fractionation: β and TDF variability in trophic position estimation. 2nd International Symposium on Isotope Physiology, Ecology, and Geochemistry, Sapporo, Japan, September 2022. Talk.

Robinson, A. L.*, Elliott Smith, E. A., **Besser, A. C.**, Tinker, T. M., Newsome, S. D. Amino acid metabolism in southern sea otters. University of New Mexico Biology Research Days, Albuquerque, NM, April 2022. Talk.

Ramirez, M. D., **Besser, A. C.**, Newsome, S. D., McMahon, K. W. Re-examining primary producer amino acid nitrogen isotope values and their influence on trophic position estimation in aquatic systems. Ocean Sciences Virtual Meeting, March 2022. Talk.

Besser, A. C., Blevins, C. M.*, Newsome, S. D. Amino acid isotope analysis reveals variation in the gut microbial contribution to protein metabolism among trophic levels in a wild small mammal community. Covid Interlude 11.5 – Applications of Stable Isotope Techniques to Ecological Studies Virtual Meeting, May 2021. Poster.

Besser, A. C., Blevins, C. M.*, Elliott Smith, E. A., Fogel, M. L., Newsome, S. D. Carbon, nitrogen, and hydrogen isotope analysis of individual amino acids reveals variation in the gut microbiome's role in the protein metabolism of wild small mammals. American Geophysical Union Fall Meeting, San Francisco, CA, December 2019. Poster.

Fogel, M. L., Nakamoto, B., Mora, K., Nye, J., Elliott Smith, E. A., **Besser, A. C.**, Smith, D., Lee, B., Newsome, S. D. Proline and isoleucine: indicators of metabolic flux and NADPH balance. American Geophysical Union Fall Meeting, San Francisco, CA, December 2019. Poster.

Besser, A. C., Blevins, C. M.*, Elliott Smith, E. A., Newsome, S. D. Amino acid isotope analysis reveals gut microbial contribution to protein metabolism in wild small mammals. American Society of Mammalogists Annual Meeting, Washington, D.C., June 2019. Talk.

Besser, A. C., Elliott Smith, E. A., Blevins, C. M.*, Patel, V.*, Barkalow, A., Turner, T. F., Newsome, S. D. Amino acid stable isotopes and heterotrophic biofilms in river food webs. Society for Freshwater Science Annual Meeting, Salt Lake City, UT, May 2019. Talk.

Besser, A. C., Elliott Smith, E. A., Dombrosky, J., Turner, T. F., Newsome, S. D. A southwestern producer essential amino acid $\delta^{13}C$ library: potential archaeological applications. Society for American Archaeology Annual Meeting, Albuquerque, NM, April 2019. Talk.

Besser, A. C., Blevins, C. M.*, Elliott Smith, E. A., Newsome, S. D. Variation in gut microbial contribution to the protein metabolism of wild small mammals. University of New Mexico Biology Research Days, Albuquerque, NM, March 2019. Talk.

Besser, A. C., Elliott Smith, E. A., Barkalow, A., Camak, D., Turner, T. F., Newsome, S. D. An essential amino acid $\delta^{13}C$ library for tracing the importance of biofilms and biocrusts in aquatic and terrestrial ecosystems. 11th International Conference on the Applications of Stable Isotope Techniques to Ecological Studies, Viña del Mar, Chile, August 2018. Talk.

Besser, A. C., Elliott Smith, E. A., Barkalow, A., Camak, D., Turner, T. F., Newsome, S. D. Developing an essential amino acid $\delta^{13}C$ library for tracing the importance of biofilms and biocrusts in aquatic and terrestrial ecosystems. University of New Mexico Biology Research Days, Albuquerque, NM, March 2018. Talk.

Besser, A. C., Dolph, C. L., Finlay, J. C. Revisiting Lindeman's work on Cedar Bog Lake using stable isotope analyses to study food web dynamics. Society for Freshwater Science Annual Meeting, Raleigh, NC, June 2017. Talk.

Besser, A.C., Haveles, A.W., Fox, D.L. The effects of interspecific interactions on food resource partitioning between the red-backed vole and meadow vole in northern Minnesota. University of Minnesota Undergraduate Research Symposium, Minneapolis, MN, April 2017. Poster.

Besser, A.C., Haveles, A.W., Fox, D.L. The Effects of Interspecific Interactions on Food Resource Partitioning between the Red-backed Vole and Meadow Vole in Northern Minnesota. University of Minnesota Earth Sciences Student Research Symposium, Minneapolis, MN, April 2017. Poster.

Outreach and Service

2023 – **Organizing Committee Member for the Arizona Astrobiology Research Symposium**
Arizona State University – School of Earth and Space Exploration

2018 – 2023 **Organizer and Instructor for a Stable Isotope Workshop for High School Students**
I helped create, organize, and teach an annual three-day stable isotope ecology short course to high school students in Albuquerque, NM. This workshop is an ongoing collaborative effort with a local citizen-science program, the Bosque Ecosystem Monitoring Program (bemp.org).

2018 – 2023 **Graduate School and Career Panelist**
I served on several graduate school and career panels for undergraduate students and postbaccalaureate scholars, including NSF REU students and ESA SEEDS participants.

2021 – 2022 **Fundraising Chair**
University of New Mexico – Biology Graduate Student Association

2021 **Graduate Student Representative on an Aquatic Ecosystem Ecologist Faculty Search**
University of New Mexico – Department of Biology

2019 – 2021 **Biology Research Days Co-Chair**
University of New Mexico – Biology Graduate Student Association

Professional Preparation

2024 Workshop: Secondary Ion Mass Spectrometry
Arizona State University – School of Earth and Space Exploration

2023 STEM Inclusion Summit
Arizona State University – Research for Inclusive STEM Education Center

2022 Workshop: Introduction to Intercultural Leadership
University of New Mexico – Department of Biology

2021 College Teaching Seminar (3-credit course)
University of New Mexico – College of Education

2020 Graduate Teaching (1-credit course)
University of New Mexico – College of University Libraries & Learning Services

2020 Workshop: Inclusive Teaching Strategies
University of New Mexico – Center for Teaching & Learning

2020 Workshop: Evidence-Based Methods for Engaging Teaching
University of New Mexico – Center for Teaching & Learning

2020 Workshop: Differential Gene Expression, Metagenomics & Visualization
New Mexico INBRE; National Center for Genome Resources

2019 Workshop: Understanding Freshwater Ecosystem Change through Analysis of Long-term Samples from Regional U.S. Fish Collections
National Science Foundation – Division of Environmental Biology

Press Coverage

UNM Newsroom (2023) – *New study by UNM alumna is first of its kind to trace amino acids synthesized by gut microbes in wild animals*

UNM Newsroom (2020) – *New research explores how fish became a bigger part of pueblo people's diet*

Peer Review Service

Peer Reviewer for *Ecosphere*, *FEMS Microbiology Letters*, *Functional Ecology*, *Journal of Animal Ecology*, and *Marine Ecology Progress Series*.