# Diana P. Bojanova

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Enthusiastic bioinformatician and biogeochemist with 6 years of experience in computational biology, complex and large-scale NSG dataset analysis, thermodynamic modeling, and isotope geochemistry. Abundant molecular, wet lab, and geochemical skills that are key for collaborating with experimentalists. Committed to generating trustworthy results that are supported by diverse analytical strategies and are contextualized with real-world parameters.

## EDUCATION

**Ph.D. Biogeochemistry, Bioinformatics**
*University of Southern California | 2023*

**B.Sc. Geophysical Sciences**
**B.A. Biological Science**
*University of Chicago | 2015*

## EXPERIENCE

**Graduate Bioinformatician and Biogeochemist**
*University of Southern California | 08/2017 - 09/2023*

Investigated the coevolution of microbial metabolism and geochemistry in the dynamic deep-sea subsurface sediments of Guaymas Basin. Specifically, evaluated the role of microorganisms in subsurface sediment methane production, described novel sulfur, nitrogen, and hydrogen catabolic pathways, reported a genetic code expansion in a bacterial lineage that allows them to perform anaerobic methylamine-based methylotrophy, compared microbial genomes across environmental conditions.

- Led several multidisciplinary collaborations, synthesizing biological and chemical data into comprehensive narratives.
- Independently devised and executed end-to-end metagenomic workflows, from DNA extraction to genome assembly and functional annotation.
- Analyzed and visualized large-scale, deeply sequenced Next-Generation Sequencing (NGS) datasets.
- Integrated metatranscriptomic data (RNA-seq) to support biomarker/genetic functionality.
- Conducted thermodynamic modeling and isotopic data analysis (traditional and clumped methane isotopes) to link microbial metabolic diversity to *in-situ* geochemistry.
- Published two multidisciplinary (but bioinformatics heavy), first author manuscripts in ISMEJ (impact factor 11.2). Third manuscript is in prep.

**Field Microbiologist**
*International Ocean Discovery Program | 09/2019 – 11/2019*

Chosen as one of nine U.S. scientists to sail on IODP expedition 385 to conduct microbiological research on and collect deep (100s of meters below the seafloor) anoxic sediment samples from Guaymas Basin for the first time.

- Created a R-script that visualized sample partitioning and made proper sample collection possible throughout the expedition.
- Managed and oversaw sample processing in the dynamic and fast paced environment of scientific ocean drilling.
- Evaluated contamination of sediment cores using perfluorocarbons.
- Collaborated with an international team of scientists, contributing to several publications in the following years.

**Research Assistant: Biogeochemistry**
*University of Maryland – College Park | 08/2016 - 05/2017*

Worked on an independent project to understand the role of sulfate reducing microorganisms and sulfur metabolism, in general, in early Earth abyssal systems.

- Cultivated anaerobic sulfate reducers with various electron acceptors and under various physicochemical conditions to mimic possible early Earth hydrogen assimilation and sulfate reduction.
- Conducted advanced Gaussian modeling to inspect reversibility in sulfur metabolism.
- Assembled a HPLC from scrap parts obtained from various laboratories.

**Research Assistant: Microbiology**
*Vanderbilt University | 10/2015 - 06/2016*

Experimentation on the highly lethal lysozyme domains of a newly discovered hydrothermal archaeon for future lethality studies against antibiotic resistant bacteria.

- Isolated domains through cloning into *Chlamydomonas reinhardtii*, as lethality was too high for insertion into *E. coli*.
- Extracted DNA / RNA of genetically modified Nasonia wasps.
- Published a first author literature review on the uses of fecal transplantation in PLOS Biology (impact factor 6; 164 citations to date).

**Research Assistant: Biogeochemistry**
*University of Chicago | 01/2013 - 06/2015*

Analyzed the diversity, physiology, and role of ammonia oxidizing archaea on the nitrification step in the Laurentian Great Lakes.

- Cultivated and isolated autotrophic microbial lineages for downstream genetic investigations.
- Extracted DNA and performed bioinformatic analysis of laboratory-grown microbial isolates and in-situ freshwater microbial communities involved in anaerobic ammonia oxidation.

**Research Intern: Honeybee Science**
*USDA, ARS | 06/2013 - 10/2013*

Investigated the effects of Varroa-Destructor-focused pesticides on the honeybee population.

- Performed manual antibiotic and pesticide feeding of bees.
- RNA extraction of honeybee thoraxes.
- Implemented Drupal to start up the i5K genomic workspace for the i5K Insect and Arthropod Genome Sequencing Initiative.

**Research Intern: Atmospheric Science**
*Johns Hopkins - Applied Physics Laboratory | 06/2010 - 08/2003*

Determined solar wind entry into the magnetosphere by creating and implementing a C# computer program which sorted out space plasma data using selection criteria.

## SKILLS

**Computational:**

- R and Python expertise.
- Bioinformatics tools and bioinformatic pipeline construction.
- Large-scale NGS dataset analysis and visualization.
- Utilization of publicly available genomic databases (GenBank, KEGG, InterPro, etc…).
- Linux operating systems.
- Git version control.
- High performance computing clusters.
- Biostatistics and machine learning.
- Enrolled in Nextflow training.

**Molecular Biology**

- Aerobic and anaerobic (with and without anaerobic chamber) microbial cultivation.
- DNA/RNA extraction and quantification.
- Library preparation.
- Protein assays.
- Molecular cloning
- Gel electrophoresis and PCR.
- PCR.
- Microscopy.

**Physical Sciences**

- Thermodynamic modeling expertise – free energy calculations.
- Gas chromatograph (GC), high performance liquid chromatograph (HPLC), and ion chromatograph (IC) utilization and troubleshooting.
- Isotope ratio mass spectrometry (IRMS) and nanoscale secondary ion mass spectrometry (NanoSIMS).
- Wet-lab, manual chemical chromatography.

**Other**

- Ocean and hot spring fieldwork involving microbial/geochemical sample collection.
- Cross-disciplinary collaborations.

## PUBLICATIONS

H-index: 8

Total citations: 549

Ramírez, G.A., Mara, P., Beaudoin, D., **Bojanova, D.P.**, Hinkle, J.E., Kingham, B., Edgcomb, V.P., Morono, Y., Andreas Teske, A.P. The DNA event horizon in the Guaymas Basin subsurface biosphere: technical advances and re-defined limits in bulk extractions of nucleic acids from deep marine sediments. *In review at IODP Data Reports (2023).*

**Bojanova, D.P.**, De Anda, V.Y. Haghnegahdar, M.A., Baker, B.J., Teske, A.P., Ash, J.L., Young, E.D. LaRowe, D.E., Amend, J.P. Well-Hidden Methanogenesis in Deep, Organic-Rich Sediments of Guaymas Basin. *ISMEJ (2023).*

**Bojanova, D.P.**, De Anda, V.Y., Appler, K.E., Mara, P, Geller-McGrath, D., Edgcomb, V.P., Teske, A.P., LaRowe, D.E., Amend, J.P., Baker, B.J. Novel sulfur and nitrogen metabolism in Lokiarchaeales and Heimdallarchaeales. *In final review stage at ISMEJ (2023).*

**Bojanova, D.P.**, De Anda, V.Y., Teske, A.P., LaRowe, D.E., Amend, J.P., Baker, B.J. Methylotrophic Diversity and Genetic Code Expansion of Dehalococcoidia in Deep Subsurface Anoxic Sediments. *In prep.*

Teske, A., Lizarralde, D., Höfig, T.W., Aiello, I.W., Ash, J.L., **Bojanova, D.P.** *et al*. Guaymas Basin tectonics and biosphere. *Proceedings of the International Ocean Discovery Program (2021).*

- **Nine individually published chapters.**

Merino, N, Aronson, H.S., **Bojanova, D.P**, Feyhl-Buska, J., Zhang, S, Giovannelli, D.
Living at the extremes: extremophiles and the limits of life in a planetary context.
*Frontiers in Microbiology (2019).*

**Bojanova, D.P.**, Bordenstein S.R. Fecal Transplants: What Is Being Transferred? *PLOS biology (2016).*

## CONFERENCES PRESENTATIONS

**Bojanova, D.P.**, De Anda, V.Y. Haghnegahdar, M.A., Baker, B.J., Teske, A.P., Ash, J.L., Young, E.D. LaRowe, D.E., Amend, J.P. Well-Hidden Methanogenesis in Deep, Organic-Rich Sediments (2022).

- *Talk at the International Workshop on Microbial Life Under Extreme Energy Limitation in Sønderborg, Denmark.*
    - *One of three PhD talks, remaining were all senior scientists.*

- *Poster presentation at the Ocean-Floor Symposium in Bremen, Germany.*
- *Talk at the International Ocean Discovery Program Expedition 385 Conference in San Giovanni, Italy.*

Eitel, E.M., Marroquin, S., Betts, M., Speth, D., Smith, B.P., **Bojanova, D.P.,** Cabrera-Cortez, A., Magyar, J.S., Miller, L, Fischer, W.W., Orphan, V.J., Sessions, A.L. (2022) The impact of anthropogenic forcing on the high-resolution biogeochemistry of laminated sediment in a hypersaline, alkaline environment within a 350-year time period. *Poster presentation at Ocean Sciences 2022 by Eryn Eitel.*

Morono, Y., Teske, A., Galerne, C.Y., **Bojanova, D.P**., Edgcomb, V.P., Meyer, N.R., Schubert, F., Toffin, L., and IODP Expedition 385 Scientists (2022) Microbial cell distribution in the Guaymas Basin subseafloor biosphere, a young marginal rift basin with rich organics and steep temperature gradient. *Poster presentation at EGU 2022 by Yuki Morono.*

**Bojanova, D.P.**, Cabrera-Cortez, A., Eitel, E.M., Smith, B.P., Magyar, J.S., Miller, L., Orphan, V.J., Fischer, W.W., Geobiology Course 2021, Sessions, A.L. (2021) The Curious Case of the Mono Lake Laminae. *Poster presentation at AGU 2021.*

**Bojanova, D. P.**, LaRowe, D.E., Amend, J.P. (2021) The Search for Well Hidden Methanogens in Guaymas Basin's Sediments. *Lightening Talk at C-DEBI Annual Meeting.*

**Bojanova, D. P**., LaRowe, D.E., Amend, J.P. (2018) The Energetic Basis of Metabolic Competition. *Poster presentation at C-DEBI Annual Meeting.*

**Bojanova, D. P.**, Amend, J.P. (2018) Deep Subsurface Microbiology and the Carbon Cycle. *Poster presentation at USC's Earth Science poster session.*

Farquhar, J., Leavitt, W., Guo, W., Eldridge, D., **Bojanova, D. P**. (2017) The Role of Reversibility and Sulfur Intermediates in the Sulfur Metabolism. *Talk given at Goldschmidt by James Farquhar.*

## ACCOMPLISHMENTS

**Awards**

- Dornsife Ph.D. Fellowship in the Sciences, University of Southern California, Los Angeles, CA (2022-2023)
    - $35,000
- Elizabeth and Jerol Sonosky and Diane Sonosky Montgomery Fellowship for Earth and Ocean Sciences, University of Southern California, Los Angeles, CA (2021 and 2022)
    - $5000/year = $10,000 total
- USSSP-IODP Post Expedition Award, Palisades, NY (2021)
    - $18,000

**Workshops**

- International Geobiology Course, California Institute of Technology, CA (2021)

    - One of 16 PhDs and PostDocs selected internationally for a 6-week intensive course in geobiological fieldwork and research.
- ECORD Summer School - Downhole Logging and Petrophysics, England (2021)
- Demystifying the IODP Proposal Process for Early Career Scientists: Pacific Ocean, Palisades, NY (2020)
- Diversity and Inclusion Workshop, STC Directors Meeting, University of California – Berkeley, CA (2018)

**Fieldwork**

- RV Pelican - Microbial Dead Zone Respiration, Gulf of Mexico (2021)
    - Six-day expedition focused on sampling the water column and performing microbiological research.
- IODP 385 - Guaymas Basin Biosphere and Tectonics, Gulf of California (2019)
    - Nine-week expedition focused on sampling deep subsurface sediments (down to ~540 meters below the seafloor) and performing microbiological and geochemical research.

## SYNERGISTIC ACTIVITIES

- **Skype a Scientist** (2020-2023)
    - Gave seminars to school aged children (elementary and high school) about how I conduct biogeochemical research by incorporating laboratory, computational, and field-based work. Introduced the field of deep subsurface microbiology and geochemistry and explained the excitement and challenges involved in sailing with scientific ocean research expeditions, as well as the scientific findings that result from it.
- **Farm LA Volunteer**, Los Angeles, CA (2018-2019; 2022)
    - This group finds underutilized land in Los Angeles and turns it into land that can give back to those in need, green the city, and grow food for our future. I have assisted with the planting and harvesting of lima bean crops that are then donated to people in need in Los Angeles.
- **Racial Equity Task Force Member,** Earth Sciences Dept., University of Southern California (2020-2021)
    - Participated in a task force focused on providing racial equity in the Earth Sciences Department at USC.
- **Paleoenvironmental Seminar Coordinator**, Earth Sciences Dept., University of Southern California (2020-2021)
    - Reached out to and organized the visit of scientists involvedin paleoenvironmental research to come and speak to the department about their work and career opportunities for PhDs and PostDocs.
- **Geobiology Symposium 2020/2021 Committee Member**, Earth Sciences Dept., University of Southern California (2019-2021)
    - Developed the website for the virtual symposium.
    - Assisted with general tasks to initially run the symposium in person (2020) and then transferring everything to a virtual environment after covid hit and moved the symposium to 2021.
- **Graduate Student Government Senator**, Earth Sciences Dept., University of Southern

California (2018-2019)

- Represented Earth Science graduate students in the USC graduate student government.
- Relayed discussed information, brought concerns to the graduate government, and voted on issues (i.e., travel funding, unionization, etc.) on behalf of the Earth Sciences graduate students.

## TEACHING AND MENTORING POSITIONS

**University of Southern California**, Los Angeles, CA

*Graduate Teaching Assistant – Oceanography (2017)*

- Independently ran three, two-hour laboratory sections for non-science-major junior and senior undergraduates to teach basic oceanographic concepts and laboratory techniques.

*Graduate Teaching Assistant – Geobiology (2021)*

- Assisted upper division Earth Sciences and Biology undergraduates with grasping and understanding concepts in the fields of Geobiology and Astrobiology through lecture, review, and assignments.

*Undergraduate Mentor (2018-2022)*

- Mentoring of multiple undergraduates in microbial and geochemical laboratory techniques, as well as computational data analysis using R and Linux command line environments. The undergraduates worked directly on my projects.

**University of Maryland**, College Park, MD

*Undergraduate Mentor (2017)*

- Mentored an incoming senior undergraduate in microbial and geochemical techniques so she could implement parts of my sulfate reduction project into a senior thesis project.