

# Grayson Boyer

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Postdoctoral Research Associate

## EDUCATION

### ARIZONA STATE UNIVERSITY

#### PHD IN BIOCHEMISTRY

May 2018 | Tempe, AZ

Cum. GPA: 4.0

### WASHINGTON STATE UNIV.

#### BS IN BIOCHEMISTRY

May 2010 | Pullman, WA

Summa cum laude

## LINKS

Home:// [gmboyer.github.io](https://gmboyer.github.io)

Github:// [gmboyer](https://github.com/gmboyer)

LinkedIn:// [grayson-boyer](https://www.linkedin.com/in/grayson-boyer)

Twitter:// [@gmboyer](https://twitter.com/gmboyer)

Kaggle:// [gmboyer](https://www.kaggle.com/gmboyer)

## SKILLS

### DATA

Confidence intervals • Decision trees •  
Detrended correspondence analysis •  
K-means and hierarchical clustering •  
Discriminant analysis • Machine learning  
• Monte Carlo simulations • Nonmetric  
multidimensional scaling • Principal  
component analysis • Random forest •  
Regex • Regression • Text mining •  
Visualization

### MODULES AND PACKAGES

CHNOSZ • dplyr • ggplot2 • numpy •  
pandas • plotly • scikit-learn

### LANGUAGES

R • Python •  $\LaTeX$  • SQL

### SOFTWARE

Agilent Masshunter • EQ3/6 • Jupyter  
Notebooks • Mathematica • Microsoft  
Excel • SUPCRT92 • Tableau

### SELECTED COURSEWORK

Computational Chemistry  
Theoretical Geochemistry  
Quantitative Biochemistry

## RESEARCH AND TEACHING

### ENKI PROJECT | DEVELOPER AND EDUCATOR

May 2017 - Present

- Developed three Python and R Jupyter notebooks to automate geochemical data cleanup, calculate properties of water samples with 50+ geochemical variables, and datamine scientifically valuable results from thousands of output files.
- Provided high-level tutorials in the use of free geochemical software tools as a part of an NSF-funded **EN**abling **K**nowledge **I**ntegration (ENKI) initiative.
- Automated complex quality control calculations for environmental water samples, reducing task time from weeks to moments and allowing easy statistical post-analysis of results.

### ARIZONA STATE UNIVERSITY | RESEARCH & TEACHING ASST.

Aug 2010 – May 2018 | Tempe, AZ

- Performed statistical analyses and visualization of environmental lipid abundance data across 30+ sample sites using a self-curated database of 3,500+ lipid structures.
- Compared observed environmental lipids and concurrent geochemical measurements to generate hypotheses regarding lipid energetic cost and function.
- Led multiple workshops introducing R and the CHNOSZ thermodynamic package to students and faculty (2011-2017).
- Curated and ensured quality control of the SLOP16 open source database containing thermodynamic properties of 2,000+ chemical species.
- Mentored an undergraduate lab research assistant (2013-2014).
- Co-chaired the session "Reaction Kinetics, Thermodynamics, and Habitability" at the Astrobiology Science Conference in Mesa, AZ, on Apr 27, 2017.

### GRANTS AND FELLOWSHIPS

- NASA Exobiology | Mar 2016 | \$852,865  
"Geochemical and Biomolecular Changes at the Transition to Photosynthesis"
- NASA Astrobiology Institute Grant | Apr 2013 | \$10,758  
"How do environmental C:N ratios influence C:N ratios of lipid biomarkers?"
- Arizona State Univ. Grad. Research Fellowship | Aug 2010 | \$19,000

### PUBLICATIONS

- Boyer, GM, and Shock, EL. Thermodynamic favorability of thermophile lipid chain modifications across a temperature and redox gradient. (Forthcoming, 2018)
- Boyer, GM, Schubotz, F, Woods, J, Shock, EL (2018) Thermophile lipid oxidation state suggests bioenergetic favorability of alkyl chain modification along temperature and redox gradients. (In preparation)
- Shock, EL, Canovas, P, Yang, Z, Boyer, GM, Johnson, K, Robinson, K, Fecteau, K, Windman, T, Cox, A (2013) Thermodynamics of organic transformations in hydrothermal fluids. *Reviews in Mineralogy and Geochemistry*, 76(1): 311-350.
- Schulze-Makuch D, Méndez, A, Fairén, AG, von Paris, P, Turse, C, Boyer, GM, Davila AF, Resendes de Sousa António, M, Catling D, Irwin LN (2011) A two-tiered approach to assessing the habitability of exoplanets. *Astrobiology*, 11(10): 1041-1052.