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<http://deichdeich.github.io>

## Curriculum Vitae

### Education

2013-2016  
Reed College (transfer)

2010-2012  
Humboldt State University

### Research Experience

*Many of the projects listed below have associated reports and code samples, all of which are available on <http://deichdeich.github.io>. All code is available on <http://github.com/deichdeich>.*

#### 2015-2016 Senior Thesis

For my senior thesis, I investigated the dynamics of a time-varying Kerr geometry. Kerr geometries result from spinning mass distributions. Most analyses approximate the spin as constant in time, which is reasonable for many applications. However, there are several physical motivations for a non-static spin, and the effect of a changing spin on orbiting test particles is nontrivial. My analysis constituted both a pure mathematical treatment combined with various numerical approaches.

#### 2014 - 2015 Researcher

I am working at the University of Utah in Salt Lake City with Anil Seth, on data from the Panchromatic Hubble Andromeda Treasury (PHAT). This project is deriving metallicity for young, massive stars in M31. I have designed several data fitting algorithms in Python to derive reddening values and metallicity. Furthermore, I wrote some simulations of stellar populations of various ages, which we used to refine the parameters of our data. I have shown that there exists a weak radial metallicity gradient in the galaxy, providing more thorough confirmation of previous spectroscopic studies. I presented the project at the 2015 meeting of AAS in Seattle, Washington, where it was a finalist for the Chambliss Award for Undergraduate Research.

#### 2013 Research assistant

In 2013, I worked at the Cerro-Tololo Interamerican Observatory (CTIO) in La Serena, Chile. This was an NSF-funded Research Experience for Undergraduates (REU). While there, I worked with Dr. Alexandre Roman-Lopes of the Universidad de La Serena and Andrea Kunder of CTIO in characterizing data from the Vista Variables in the Via Lactea (VVV) Survey. I applied PSF and aperture photometry to the data with the DAOPHOT package, and wrote numerous data analysis scripts in Python. By matching sources with the 2MASS survey, I derived correlation functions between the two surveys, which significantly reduced error, and has wider application in the use of VVV data. I presented the project at the winter 2014 meeting of the AAS conference in Washington, DC.

While in Chile, I collected data on two telescopes there. I spent two nights on the 0.9-meter SMARTS telescope and three on the 4-meter Blanco telescope using the new Dark Energy Camera (DECam), as part of the Dark Energy Survey. The data from the Blanco is being used by Dr. Armin Rest of Harvard University in a 2014 paper.

#### 2013 Reactor operator

In 2013, I trained as a nuclear reactor operator on the Reed Research Reactor, where the research centers around quantitative neutron activation analysis for trace-element concentrations.

2010-2012 Research assistant

From 2011 to 2012, I assisted Dr. Ryan Campbell at Humboldt State University in Arcata, California, in photometric and spectroscopic studies of Low-Accretion Rate Polars (LARPs).

My duties included CCD image reduction with IRAF as well as Python and FORTRAN scripting. By using time-resolved spectroscopy, we were able to create a three-dimensional model of the LARP, indicating where the accretion columns were on the surface. The model was obtained with a genetic algorithm built using the PyEvolve package.

### **Relevant Small Projects**

2015 Data fitting

When an exoplanet crosses between its star and the Earth, telescopes record a dip in the star's light. The plot of the intensity of the light over time, or 'light-curve' is a frequently used measurement to determine various parameters about an exoplanet. I wrote a small Python script to fit analytically determined lightcurves to data. The script used a steepest-descent algorithm to determine the fit. It was determined that steepest-descent was too liable to get stuck in local minima to be useful.

2015 FTIR spectroscopy of Ag<sup>+</sup> in photofilm

With another student at Reed, I performed fourier transform infrared (FTIR) spectroscopy on consumer-grade photography film to determine the absorption of metallic silver. In addition to taking the measurements, I wrote a small peak-finding script to analyze the data.

2015 Visualization of 1-Dimensional Quantum Potentials

To learn how to use an animation library in Python (matplotlib.animate), I wrote a script which solves Schrodinger's equation for a particle in an arbitrary 1D potential, and renders the result in real time.

### **Presentations**

2014

Poster at winter meeting of the American Astronomical Society, Photometric Analysis of Clusters in the Vista Variables in the Via Lactea (VVV) Survey

2015

Poster at winter meeting of the American Astronomical Society, Metallicities of Young PHAT Stars

### **Relevant Work Experience**

2015-Present Physics grader, Reed College

2014-Present Science outreach teacher

Since the spring of 2014, I have taught science to 10- and 11-year-olds at elementary schools throughout Portland, Oregon, through Reed College's science outreach program.

2011-Present Visiting science teacher

Three or four times a year for the last few years I have led a sixth-grade science class in lectures on astronomy at New Brighton Middle School.

2011-2012 Physics & mathematics tutor, Humboldt State University

2011-2012 Physics grader, Humboldt State University

### **Computer Skills**

Programming Languages:

Fluent: Python (including SciPy, NumPy, PyLab and AstroPy)

Very good: Mathematica, C, IDL

Familiar (in decreasing order): LabVIEW, FORTRAN, AWK, MATLAB

Operating Systems: Mac OS, multiple distributions of Linux/Unix-based OS  
Software: IRAF, TOPCAT, THELI, ds9  
Other: LaTeX, vim, Microsoft Office, familiar with various social media outlets

**Languages**

Conversationally proficient in Spanish, can read and write Dutch

**Membership**

Society for Physics Students Winter 2013-present  
American Astronomical Society (junior membership) Fall 2013-present

**References**

Dr. Anil Seth, University of Utah  
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Dr. Alison Crocker, Reed College,  
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