# GRIFFIN S FOSTER


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## PROFILE

Researcher with over a decade experience in high-bandwidth signal processing and data analysis with a strong background in physics, computer science, and electrical engineering. Currently developing new techniques to automate radio astronomy observations and SETI (Search for Extraterrestrial Intelligence) surveys using statistical and machine learning techniques. Past work has focused on building high-bandwidth FPGA-based instruments and searching for rare signal events. Author of numerous peer-reviewed journal manuscripts and currently writing a textbook on observational astronomy. I am interested in applying my technical and research skills to practical problems in data processing and analysis.

## EDUCATION

University of Oxford, St. Peter's College *2009-2013*

*Ph. D.* *Astrophysics*
Thesis: *Large-N Correlator Systems for Low-Frequency Radio Astronomy*

University of California, Berkeley *2003-2007*

*Bachelor of Arts* *Physics and Astrophysics · College of Letters and Science*
Double major, with a minor in Computer Science

## VOCATIONAL HISTORY

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| · Post-doctoral Researcher | University of Oxford, Astrophysics (*Nov. 2016–Present*) |
| · Post-doctoral Research Fellow | Square Kilometre Array South Africa (*July 2013–Oct. 2016*) |
| · DPhil Student, Researcher | University of Oxford, Astrophysics (*Oct. 2009–June 2013*) |
| · Research Associate | University of California, Berkeley (*Apr. 2007–Oct. 2009*) |

## VOCATIONAL SKILLS

*Technical Writing*

- Lead author and contributor to 12+ peer-reviewed articles published in high impact factor scientific journals.
- Editor and lead author of a textbook for a Masters' level course on radio astronomy instrumentation.

*Communication*

- Presented technical talks at dozens of scientific conferences on radio astronomy, machine learning, signal processing, and hardware design.
- Organized and lectured university-level courses in astronomy and signal processing.
- Given scientific talks on astronomy and SETI for a public audience.

*Team Work and Management*

- Advisor to multiple masters' and doctoral students.
- Lead the Breakthrough Listen SETI (Search for Extraterrestrial Intelligence) machine learning team, design teams. for radio astronomy instrumentation and data analysis groups.

*Software Design*

- Developed and support multiple open-source Python-based scientific data analysis packages.
- Wrote Python and C-based code to calibrate and produce sky maps from the reduced streaming data using linear algebra and Fourier techniques.
- Worked with many scripting and compiled languages to develop scientific software, distributed computing, and web interfaces.

*Data Processing and Analysis*

- Developed machine learning-based anomaly detection methods for 50+ TB data sets from Breakthrough Listen and radio transient surveys.
- Used feature detection techniques from computer vision to automate source finding and rare event detection.
- Classification of radio galaxy images using basis decomposition (shapelet, wavelet) and wide learning techniques (PCA, SVM, ensemble methods).

*Hardware Design*

- Led the design of FPGA-based, streaming cross-correlation instruments (ingesting $\sim$100 Gbps data rates and reduced output rates of $\sim$100 Mbps) for telescopes in the UK, the USA, Italy, and South Africa.
- Built pipelines and automated triggers for processing multi-TB per day datasets using heterogeneous systems of FPGAs, GPUs, and CPUs.

## TECHNICAL SKILLS

*Mathematics* Digital Signal Processing, Linear Algebra, Statistics, Fourier Analysis, Multivariate-Calculus, Basis set decomposition, Discrete Mathematics

*Computing Languages* Python, Matlab/Octave, SQL, PHP, HTML/CSS, C, BASH/shell scripting, $\lambda$, LaTeX

*Analysis Techniques and Tools* TensorFlow, scikit-learn, SVM, Ensemble learning, PCA/SVD, Embedding and dimensionality reduction, Neural Networks (recurrent, convolutional), Gaussian Processes, Fourier and Basis Transforms, Computer Vision and Imaging Processing

*FPGA Design* VHDL, Matlab/Simulink, Xilinx ISE, Altera Quartus

*Electronics and Mechanical Lab* Digital hardware setup, board testing, analogue component testing, soldering, can operate lathes, mills, and presses