

Thomas Wagg | Curriculum Vitae

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Research Fellow at Center for Astrophysics | Harvard & Smithsonian

Education

Harvard University

A.B. in Physics and Astrophysics, Secondary in Computer Science, GPA: 3.82
Cum Laude with Highest Honours in Field

Cambridge, MA

2016–2020

Newcastle-under-Lyme School

GCSEs and A-Levels

14 GCSEs with A*s

5 A-Levels, four A*s and A, in Maths, Further Maths, Physics, EPQ (focus on Nuclear Fusion) and Latin respectively

Newcastle-under-Lyme, England

2004–2016

Research Experience

Senior Thesis: Detecting Black Hole–Neutron Star Binaries with LISA

2019–Present

Supervisor: Professor Selma de Mink, Floor Broekgaarden (PhD Candidate in Astronomy)

Harvard University

I estimated the detectability of black hole–neutron star binaries with LISA. I used binary populations created with the population synthesis code COMPAS to simulate random instances of the Milky Way. For each random Milky Way, I evolved approximately 10,000 binaries from birth to the present day and calculated which binaries would be detectable by LISA. Using these simulations, I produced detection rates and final distributions of various binary parameters to illustrate the differences between the total and detectable populations. I will continue this work in the next months as a Fellow at the Centre for Astrophysics at Harvard.

Modelling Migrating Subpopulations in Changing Environments

Summer 2019

Supervisor: Professor Michael Desai

Harvard University

I devised a new model for the genetic evolution of a 2-allele asexual population. My model accounts for the effects of migration and also environmental changes (such as climate change), two features generally neglected in other models. I created a simulation based on this model in order to ascertain the model's level of agreement with physical experiments. Moreover, I used the simulation to investigate the effects of altering environmental and migrational parameters such as the rate of switching between environments and the number of subpopulations between which individuals could migrate.

High Redshift and Luminous Red Galaxies

2018–2019

Supervisor: Professor Daniel Eisenstein

Harvard University

I formulated a pipeline that allows us to identify the thousands of luminous red galaxies (LRGs) within the Legacy Surveys data and to create a redshift distribution using the VIPERS galaxy catalogue. Additionally, using this pipeline, I can cross-correlate the pixelized representation of the sample with maps of the Sunayev Zeldovich effect and cosmic infrared background and assign galaxies to clusters. As new data releases have occurred, our pipeline has been used to further refine our understanding of these LRGs and identify them at higher redshifts than previously possible.

Class Project: A Search for the Higgs

2018

Supervisor: Professor Roxanne Guenette

Harvard University

I analysed data from the ATLAS open data project with a view to uncovering a Higgs signal from the WW channel. I used high statistics analysis on the WW decay to improve target selection and remove background signals, such as Drell-Yan processes and t decay. Then I created a series of cuts for the low statistics analysis on the mass and energies of the product in order to find a Higgs signal. This culminated in a poster presentation to the Harvard Physics department.

Lab Project: Acoustic Levitation and Visualising Sound

2017

Supervisor: Professor Markus Greiner

Harvard University

I built a white light interferometer and demonstrated acoustic levitation. Using a stroboscopic light source in addition to an ultrasound generator I was able to show the effect of high frequency sound waves on air density. Once the sound waves appeared as standing waves, I demonstrated that it was possible to achieve acoustic levitation of small Styrofoam balls and observe the waves using the interferometer.

WASP Exoplanet Survey

Supervisor: Professor Coel Hellier

2013–2015

Keele University, England

During my school breaks in high school, I worked with Professor Coel Hellier on the WASP project. I inspected candidate light-curves for potential planets as well as used MCMC analysis to determine the parameters of known planetary systems. I discovered WASP-142b, becoming the youngest person ever to discover an exoplanet.

Work Experience

Senior Programmer

Employer: Judaica Division of Widener Library

2016–2020

Harvard University

As the senior programmer for the Judaica Division of Widener Library, I am responsible for automating library operations and helping to maximise the efficiency of workflows. I work closely with the division heads to hone my designs exactly to their goals and get feedback from other student workers on how to improve the tools that I design. Among the many tools I've created for the division, two highlights include a chrome extension that automates Alma, the web based library management software, and a Windows desktop app for creating wire transfer requests and efficient searching of vendor book lists.

Project Manager

Employer: Mather House

2019

Harvard University

In spring 2019, I took initiative to develop MeetMather, a tool designed to build community within Mather House at Harvard. Following approval from Mather's Faculty Deans, I spent four months designing and building a web app that allows undergraduates to search for other students with similar interests within their house. Additionally, I added a feature for inputting your classes and getting placed into study groups within the house to encourage collaboration. Having garnered enthusiastic praise from Harvard officials, I have been asked to adapt this app for all twelve Harvard houses, making it accessible to over 5000 undergraduates.

Teaching Experience

Teaching Fellow

Employer: Harvard School of Engineering and Applied Sciences

2019

Harvard University

As a teaching fellow for CS61, a class of 250 students, I was responsible for holding office hours, teaching a section to 30 students and grading problems sets and exams. I helped students to understand computer systems with topics such as operating systems, assembly code and multiprocessing.

Tutor

Employer: Harvard Student Agencies

2016–2020

Harvard University

I tutor Harvard College and Extension Students as well as local high-school students in Physics, Maths and Computer Science.

Coach of Harvard Club Field Hockey

Employer: Harvard Club Field Hockey

2018–2019

Harvard University

Every week, I organised and facilitated two practices and coached a weekend match for our team of 30 students. Under my leadership, our team rose from 86th place to 15th place nationwide.

Awards and Fellowships

Leo Goldberg Prize

Prize awarded by the Harvard Astronomy Department for the best astronomy senior thesis

May 2020

Bloomberg Creative Science Prize

Prize awarded by Mather House of Harvard College for the most insightful and creative senior thesis in the natural sciences.

May 2020

Alex G. Booth Fellowship

Fellowship awarded to recent Harvard graduates for research by Harvard College

April 2020

Haase Fellowship

Grant for research from Harvard University Physics Department

June 2018

Harvard College Research Program Grant

Funding for summer research from Harvard College

2017, 2018 and 2019

Publications

Maxted, PFL and Anderson, and others. **Five transiting hot Jupiters discovered using WASP-South, Euler, and TRAPPIST: WASP-119 b, WASP-124 b, WASP-126 b, WASP-129 b, and WASP-133 b.** *Astronomy & Astrophysics*, 591:A55, 2016. [ADS Link](#).

Hellier, C., and others. **WASP-South transiting exoplanets: WASP-130b, WASP-131b, WASP-132b, WASP-139b, WASP-140b, WASP-141b and WASP-142b.** *Monthly Notices of the Royal Astronomical Society*, 465(3):3693–3707, 2017. [ADS Link](#).

Computer Skills

Programming: C, Python, JavaScript, HTML+CSS

Applications: \LaTeX , Mathematica, Matlab

Extracurricular Interests

Field Hockey - In my time at Harvard, I played for and coached the Harvard Club Field Hockey team. I also joined the Boston Minutemen, playing for the men's team at the US national championship. Moreover, in my senior year I was welcomed to practise with the Harvard Varsity Field Hockey team by Coach Tjerk Van Herwaarden. I am the first male player to have ever practised with the team.