Brooks J Rady

Student at The University of Sheffield

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OBJECTIVE

A perpetually curious student with a keen interest in biological research and computer science. Seeking to engage in research and work alongside professionals in the field to further mankind's understanding of the world.

FORMAL EDUCATION

Molecular Biology at The University of Sheffield (2019-2022)

Weighted Average: 86.50%

Valerie Broomhead Prize – Best Level 1 Practical Mark

Paul Hancock Prize – Best Level 2 Practical Mark

Bioengineering at The University of Sheffield (2018-2019)

Weighted Average: 89.25%

Sir Harold West Award – Academic & Personal Promise

Prospect Ridge Academy High School, USA (2014-2018)

GPA: 4.74 (4.00)

Graduated Summa Cum Laude

National AP Scholar Award

First Place for Senior Capstone Project

EXPERIENCE

Peptidoglycomics Tool Development (Summer 2021)
Placement Work in the Mesnage Lab, Sheffield UK

A wealth of tools are available for the analysis of mass spectrometry data from proteomics experiments; however, only one is dedicated to peptidoglycan structural analysis. I helped improve the recently published PGFinder tool by integrating it with a downstream MS/MS analysis program developed in the Mesnage lab.

- Characterised peptidoglycan via LC-MS and MS/MS
- Developed a tool for predicting PG fragments
- Identified and fixed a bug in MS/MS ion generation
- Validated pipeline via manual spectrum inspection

Study of *Myxococcus* Motility & Sporulation (Autumn 2021)
Placement Work in the Hoiczyk Lab, Sheffield UK

Myxococcus xanthus is a model organism for motility, development, and multicellularity in bacteria. During my project, I generated deletion mutants to improve the purity of a protein isolation and designed a variety of novel screens for the identification of a diffusible pheromone involved in fruiting body formation.

- Learned plasmid design, cloning, and sequencing
- Generated deletion mutants via allele exchange
- Purified protein complexes from whole-cell lysate
- Verified isolations via SDS-PAGE and Western blot
- Analysed single molecule assemblies using EM
- Applied 3D printing to create novel agar moulds
- Imaged fruiting bodies via light & stereo microscopy

Peptidoglycan Hydrolase & Rhizobium Reviews (2020/2021)
Mini-Reviews in Molecular Biology – https://bit.ly/3qgB60Q

I completed two mini-reviews on the rhizobium-legume symbiosis and the regulation of peptidoglycan hydrolases. Both papers were limited to 2000 words of body text, so writing in a clear and concise fashion was critical to capturing the full picture.

- Distilled complex topics into digestible sections
- Managed 70+ in-text references using Zotero
- Generated figures using PyMOL, GIMP & Inkscape
- Professionally typeset the reports in LaTeX

Plant Growth Protocol Standardisation (2020-Current)
Designer and Developer at Grobotic Systems, Sheffield UK

Grobotic Systems is one of many companies producing growth chambers for use in plant science; unfortunately, there is no standard for how the protocols run by these chambers should be written. I developed a human and machine readable protocol format that allows the same protocol to be run by several different growth chambers.

- Gained a familiarity with plant growth protocols
- Worked with other scientists to develop a standard
- Built a protocol-to-setpoint compiler in Rust
- Created a web tool for protocol compilation in WASM
- Added a dynamic JS graph for protocol visualisation

Mechanical, Electrical, and Software Engineer (2020-Current)
Bioreactor Development for Evolutor, Sheffield UK

Advised by Dr. Tuck Seng Wong from Chemical and Biological Engineering, I developed a compact, inexpensive prototype bioreactor optimised for carrying out directed / adaptive evolution in an automated fashion – allowing for the optimisation of industrially important microbe strains.

- Leveraged CAD to prototype a reactor from scratch
- Manufactured reactor components via 3D printing
- Developed custom sensor and control electronics
- Created a dashboard in Svelte for reactor monitoring
- Experimentally characterised device performance
- Integrated user feedback into the device design

Software Lead & Co-Presenter (2019)
Member of the University iGEM Team, Sheffield UK

iGEM is a synthetic biology competition involving universities from around the globe. Our team designed a low-cost, open-source microplate reader for use in community labs. I developed the software that powered our device and presented our project at conferences in Newcastle, UK and Boston, USA.

- Developed low-level firmware for an ESP32 in C
- Built a web-interface using HTML, CSS, and JS
- Displayed an aptitude for project presentation
- Exercised team communication and planning skills
- Awarded Best Presentation in the UK
- Won Best Open Project and Gold Medal in Boston

REFERENCES

Dr. Egbert Hoiczyk, Project Supervisor & Lecturer in Microbiology <e.hoiczyk@sheffield.ac.uk>
Dr. Tuck Seng Wong, Lecturer in Chemical & Biological Engineering <t.wong@sheffield.ac.uk>

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ADDITIONAL WORK

Personal Web Server (2015-Current)
File-Sync, VPN, DLNA, FTP, Games, Blockchain, and Website — http://thelostlambda.xyz/

Workshop Development for Sheffield Bionics Society (2020-2021)
Video and Blog Content for Teaching Python, CAD, ML, and Electronics – https://bit.ly/3qs5xSf

Haskell Fives-and-Threes Dominoes AI (2020)
A Tournament-Winning Dominoes AI and Accompanying Performance Report — https://bit.ly/3qoQpVx

Sickle Cell Disease: Symptoms, Molecular Basis, and Treatments (2019)
A Mini-Review Focused on Sickle Cell Pathogenesis — http://bit.ly/2E7Yu9x

Lost in Translation: Proteins Post-Expression (2019)
Scientific Poster on the Post-Translational Modification and Transport of Proteins — http://bit.ly/36bKMPG

Under Pressure — Hydrostatics and Elastic Tube Distention (2019)
Modelling a Biophysical System from Image Data — http://bit.ly/2qMQmYA

Creepy Phenomena: An Investigation of Viscoelasticity (2019)
Mathematical Analysis of a Physical System from Video Footage — http://bit.ly/2PkNP2b

Tissue Who? — A Foray into Histology and Tissue Identification (2019)
A Short Histology Primer & Lab Report — http://bit.ly/2ooernJ

In Vivo Detection and Signaling of Arbitrary DNA Sequences (2018)
High School Capstone Project Exploring a Novel Use for CRISPR — http://bit.ly/2pbA9fk

Pokéstats — What Type Of Pokemon Is The Match For You? (2018)
A Statistical Report Exploring a Large Pokémon Dataset — http://bit.ly/2FVjMqh

The Regicide of the Fisher King (2018)
AP English Literature Modernism Essay — http://bit.ly/2FHoYSy

Honors Physics "Build a Planet" Project (2017)
Exploring and Mathematically Modelling the Physics of a Fictional Planet — http://bit.ly/2IA9f5F

FTC_HTTP Programming Tool (2017)
A Cross-Platform Application for the Wireless Programming of FTC Robots — http://bit.ly/ftc_http

AWARDS & CERTIFICATES

· Phil Green Trophy for Best Haskell Dominoes AI in COM2108 Tournament (2020)
· Won Best Open Project & Gold Medal during iGEM Jamboree (2019)
· Awarded Best Presentation during iGEM UK Meetup (2019)
· Best Communicated Solution during EWB Global Engineering Challenge (2019)
· Linnaeus Award for Excellence in Biology (2018)
· Hacker Award for Excellence in Computer Science (2018)
· National Honor Society (2017-2018)
· Prospect Ridge Academy High Honor Roll (2015-2018)
· Design Award & Finalist Alliance at FTC State Championship (2017-2018)
· Second place in Junior Energy and Transportation at Colorado Science and Engineering Fair (2014)
· First place in Alternative Fuels at Denver Metro Science Fair (2014)

HOBBIES & INTERESTS

I'm into anything that bytes – I built my first PC at 14 and have used it to teach myself programming, learn how to manage a Linux server, and enjoy some video games. Though I don't care much for commercial projects, I've spent a large amount of my time contributing to open-source: developing infrastructure and course content for Exercism, authoring large portions of the Zellij terminal application, and countless smaller contributions.

Alongside this has been an enduring interest in robotics: I founded PRA robotics at my high school and have been part of Avalon, Bionics, and Project Hex since coming to Uni – three different student-led robotics groups. My passion for learning extends to teaching, and I've represented my course as academic officer, tutored first year biologists, and delivered lessons in coding, engineering, and ethical hacking all across campus.

I enjoy both hiking and rock climbing, and though I can't draw to save my life, I've recently taken up digital photography and enjoy graphic design. I've been learning German for nearly four years now and my 125,902 minutes of listening to music in 2020 means I'm probably a bit obsessed with "Midwestern Emo" – unfortunately, I'm still waiting for the philosophy I've been reading and writing about to make sense of all that...

REFERENCES

Dr. Egbert Hoiczyk, Project Supervisor & Lecturer in Microbiology <e.hoiczyk@sheffield.ac.uk>
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