Charlotte **Brass**

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Pembroke College, Trumpington St, Cambridge, UK

EDUCATION

Oct 2020 - Present **University of Cambridge, England**
Doctor of Philosophy (PhD) in Medical Engineering
Thesis: Biomechanics of Traumatic Brain Injury
Supervisors: Prof. Michael Sutcliffe, Dr. Virginia Newcombe, Dr. Angelos Kolias

Sept 2015 - Jul 2020 **Cardiff University, Wales**
Master of Engineering (MEng) in Mechanical Engineering with Year in Industry
Graduated with First Class Honours, average grade of 82% or 4.0 GPA equiv.
Industrial placement: Williams Racing (Formula 1)

ENGINEERING EXPERIENCE

Oct 2020 - Present **University of Cambridge** **Cambridge, England**
PhD in Biomechanics of Traumatic Brain Injury
Examining time-based evolution of severe traumatic brain injury post surgical intervention through finite element analysis and novel application of computer imaging techniques.

- Created a finite element model of decompressive craniectomy (DC) surgery inclusive of membrane anatomy to predict deformation and strain.
- Used this model to evaluate DC against other novel decompressive surgeries using finite element analysis and provide recommendations to improve patient outcomes.
- Extracted craniectomy brain expansion contours and related contours to a mathematical model as part of a collaboration I established with Ellen Kuhl (Stanford University) and Alain Goriely (University of Oxford).

Jun 2019 - Sep 2019 **Diamond Light Source** **Oxford, England**
Mechanical Design Engineer

- Optimized the cryogenic sample preparation process of micron-sized protein crystals
- Evaluated risk to crystals during each stage of the optimization process, involving developing rapid understanding of biological sample generation and needs
- Provided recommendations to improve efficiency and quality of the preparation procedure, summarised in a comprehensive report.

Aug 2017 - Aug 2018 **Williams Racing (Formula 1)** **Oxford, England**

Junior Design Engineer

- Designed parts used in radiator ducts, electronics packaging and fuel cell manufacture in NX CAD software using DFM and GD&T principles
- Managed full product life cycle (PLM) of these parts using version control software
- Maintained accurate records of service and lifing documentation for safety-critical parts to ensure traceability, accountability and regulatory compliance

SKILLS

Technical Skills

Finite Element Analysis (FEA)	Analysis of complex geometry, soft materials and scripting in Abaqus (Dassault Systèmes)
Programming	Python for computer vision and data analysis, Bash scripting, FSL (FMRIB) for brain image analysis, version control with Git and GitHub, LaTeX
Medical Imaging	DICOM file processing using Mimics, 3-Matic (Materialise) and MeshLab
Cluster Computing and Job Scheduling	Experienced with HPC clusters, job scheduling systems (SLURM), and development of submission scripts for automated workflows
Computer Aided Design (CAD)	Surface, solid, and shell modelling and drafting using NX (Siemens), Creo, and Solidworks (Dassault Systèmes)
Engineering Design	Geometric dimensioning and tolerancing (GD&T), product lifecycle management (PLM), design for manufacture (DFM) principles

Soft Skills

Communication	Regular oral presentations to technical, general and clinical audiences at lab meetings, departmental seminars and conferences
Project Management	Used my initiative, curiosity and perseverance to create a collaboration project with international experts from scratch
Teamwork and Leadership	Led diverse student team to create a business plan for fledgling startup as part of Cambridge Judge Business School EnterpriseTECH program
Adaptability	Rapid assimilation of new knowledge outside of prior training facilitates my application of mechanical concepts to medical areas

TEACHING EXPERIENCE AND OUTREACH

Sep 2022 - Present	**Lab Demonstrator** Milling and lathe machines for first year undergraduates, machine design, gyroscopic motion for third year undergraduates
May - June 2022, 2023 & 2024	**Undergraduate Supervisor** Forum chair for solo 3rd year project peer-to-peer supervision sessions, assessment and grading of presentations
Feb 2021 - May 2021	**Gonville & Caius Norfolk Outreach** Designed and ran my own course of 10 outreach supervision-style sessions for 16-17 year old students at underprivileged local schools

SELECTED PRESENTATIONS

1. Living Matter Lab, Stanford University: "Traumatic Brain Injury Treatment Modelling", 12 Mar 2024. [oral presentation]
2. 10th Summer School on Biomechanics of Soft Tissues, TU Graz: "Decompressive Neurosurgical Procedures for Treatment of Traumatic Brain Injury", 13 Sep 2023. [oral presentation]
3. Neuralink, Fremont: "Modelling the Brain", 27 Jul 2023. [oral presentation, final round interview]
4. Division C Graduate Conference, University of Cambridge: "Brain Injury Mechanics and Surgical Modelling", 23 Mar 2022 [oral presentation, prize for best second year PhD presentation]
5. Division C Graduate Conference , University of Cambridge: "Traumatic Brain Injury: Macroscale Treatment and Microscale Modelling", 9 Mar 2021. [poster]

PUBLICATIONS

1. **Brass, C. M.**, Devi, B. I., Kolias, A. G., Newcombe, V. F. J., Sutcliffe, M. P. F. Mechanics of Decompressive Craniectomy: A Membrane Model. [working title, manuscript in preparation]
2. **Brass, C. M.**, Devi, B. I., Kolias, A. G., Newcombe, V. F. J., Sutcliffe, M. P. F. A Comparison Study of Surgical Decompression Procedures using Finite Element Analysis. [working title, manuscript in preparation]
3. **Brass, C. M.**, Goriely, A. G., Kuhl, E., Newcombe, V. F. J., Sutcliffe, M. P. F. Mapping Craniectomy Bulge from Patient Data to Mathematical Ellipsoid Model. [working title, manuscript in preparation]

ACADEMIC AFFILIATIONS

Jan 2024 - Present	**Living Matter Lab, Stanford University** *Associate Researcher*
Jan 2024 - Present	**International Brain Mechanics and Trauma Lab, University of Oxford** *Associate Researcher*
Oct 2020 - Present	**Biomechanics Research Group, University of Cambridge** *Member*

INTERESTS AND ACTIVITIES

Sports

Jul 2024 - Apr 2024	Fatcake Cycling Club: Member and Peninsula Chapter ride leader
Sep 2021 - Jun 2023	Pembroke College Boat Club Ladies 1^{st} VIII
Sep 2019 - Sep 2021	Competition road cyclist with Will Houghton Racing Team
Sep 2015 - Present	University Triathlon: Cardiff, Cambridge and Stanford

Music: Piano Grade 8 • Flute Grade 8 • Aural & singing
Other: Travel • Writing • Cooking • Personal static website and blog at *www.charlottebrass.org*

REFERENCES

Michael Sutcliffe, mpfs1@cam.ac.uk
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