# 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**

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| 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, FSL (FMRIB) and FreeSurfer (Harvard) for neuroimaging 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**

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| 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 |

## POSITIONS OF RESPONSIBILITY AND TEACHING EXPERIENCE

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| Jun 2024 - Present | **Women and Marginalised Genders Representative**<br>Gender specific pastoral support for members of the Pembroke College graduate community |
| Sep 2022 - Present | **Lab Demonstrator**<br>Milling and lathe machines for first year undergraduates, machine design, gyroscopic motion for third year undergraduates |
| May - June 2022, 2023 & 2024 | **Undergraduate Supervisor**<br>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**<br>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. A Comparison Study of Surgical Decompression Procedures using Finite Element Analysis. [working title, manuscript in preparation]
2. **Brass, C. M.**, Goriely, A. G., Kuhl, E., Newcombe, V. F. J., Sutcliffe, M. P. F. Herniation in Decompressive Craniectomy: Correlation Between Severity of Herniation and Fractional Anisotropy Changes at Aperture Edge [working title, manuscript in preparation]

## ACADEMIC AFFILIATIONS

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

## INTERESTS AND ACTIVITIES

**Sports**

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| 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*
Dept. of Engineering, University of Cambridge, Trumpington Street, Cambridge, CB2 1PZ
*Virginia Newcombe, vfjn2@cam.ac.uk*
University Division of Anaesthesia, Cambridge University Addenbrooke's Hospital, Hills Road, Cambridge, CB2 0QQ
*Ellen Kuhl, ekuhl@stanford.edu*
James H. Clark Center, Stanford University, 318 Campus Dr, Palo Alto, CA 94305