James Brind

Research Associate in Turbine Aeroacoustics, Whittle Laboratory
Bye-Fellow, Fitzwilliam College
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Current position

2019 – present **Research Associate in Turbine Aeroacoustics**
Whittle Laboratory, University of Cambridge
- Quantifying reflections of sound waves from turbines using analytical models and time-marching computational fluid dynamics
- Mean-line and three-dimensional studies to explore the design space
- Implementing methods in software for use by industrial sponsor MHI

Education

2015 – 2019 **Ph.D. Gas Turbine Aerodynamics**
Whittle Laboratory, University of Cambridge, Corpus Christi College
Thesis title: "The Effect of Blade Row Interaction on Rotor Film Cooling"
Supervisor: Dr. Graham Pullan; sponsors: MHI and EPSRC
- Novel measurements showed that if film cooling responds non-linearly to unsteady flow, current rotor design methods are in error
- High-fidelity computations show non-linear cooling reduction of 30%
- New design guidelines and hierarchy of models for rotor film cooling

2014 – 2015 **M.Res. Gas Turbine Aerodynamics** – Pass with Distinction
Whittle Laboratory, University of Cambridge, Corpus Christi College
- Graduate-level lecture courses, practical coursework, industrial visits
- Placed second in cohort scoring 79% overall

2010 – 2014 **M.Eng. Mechanical Engineering** – Pass with Distinction
Department of Engineering, University of Cambridge, Peterhouse
- Achieved first-class results every year, ranking in top 10 percent
- ⋆ Sir Christopher Cockerell Scholarship in Engineering
- ⋆ Hugo de Balsham Prize for Exceptional Academic Distinction

Funding

2022, 2024 **Freeman Scholarship** – 2x £5k for summer internship students
- Awarded from Whittle Laboratory Freeman Fund for innovative research
- Application of machine learning methods to database of literature measurements to produce an open-source film cooling design tool
- Implementation of inverse design methods to automatically create high-efficiency turbomachine blade shapes from an aerodynamic duty

Publications

2024 **Brind, J.**, "Data-driven radial compressor design space mapping". Accepted for presentation at *ASME Turbo Expo*; publication in *J. Turbomach*

2023 **Brind, J.**, "Acoustic boundary conditions for can-annular combustors". *Int. J. Turbomach. Propuls. Power*, doi:10/kvd6; *Proc. ETC15.*

2022 **Brind, J.** "The acoustic impedance of three-dimensional turbines". *J. Sound Vib.*, doi:10/jd4n; preprint.

2021 **Brind, J.**, Pullan, G. "Modelling Turbine Acoustic Impedance". *Int. J. Turbomach. Propuls. Power*, doi:10/gg4k; *Proc. ETC14.*
⋆ Winner of European Turbomachinery Society Best Paper Award

2020 **Brind, J.**, Pullan, G. "Effect of Blade Row Interaction on Rotor Film Cooling". *J. Turbomach.*, doi:10/ggwm; *Proc. ASME GT2019*, doi:10/ggwn.
⋆ Nominated for IGTI Heat Transfer Committee Best Paper Award

2020 Grimshaw, S.D., **Brind, J.**, Pullan, G., Seki, R. "Loss in Axial Compressor Bleed Systems". *J. Turbomach.*, doi:10/ggwq; *Proc. ASME GT2019*, doi:10/ggwr

Presentations

2023 **15th European Turbomachinery Conference** *Budapest, Hungary*

2022 **CDT in Future Propulsion and Power Seminar** *University of Cambridge*

2021 **14th European Turbomachinery Conference** *Gdansk, Poland (online)*

2019 **ASME Turbo Expo** *Charlotte, NC, USA*

2017 **Fluids, Energy and Turbomachinery Exposition** *University of Cambridge*
⋆ Awarded Best Presentation Prize

2015–present **MHI Turbomachinery Workshop** *Takasago, Japan*
Annual presentations to senior engineers from industry sponsor and international academic collaborators

Teaching

2020–present **M.Eng. Fourth-year Project Supervision**
Department of Engineering, University of Cambridge
Proposing a project with educational and research value, guiding student at weekly meetings, marking presentations and reports
◦ Lead supervisor: 2 projects; co-supervisor: 4 projects

2019–present **Teaching Bye-Fellow**
Fitzwilliam College, University of Cambridge
Elected to a Fellowship on the basis of teaching excellence

2019 **Associate Fellow of the Higher Education Academy**
Teaching Associates Programme, Cambridge Centre for Teaching and Learning

2015–present **Undergraduate Supervision**
Various colleges, University of Cambridge
Small-group teaching: discussing problem sheets with students, preparation of supplementary materials, setting and marking progress tests
- Mathematical Methods, Part IB (5 years)
- Thermofluid Mechanics, Part IB (3 years)
- Thermodynamics and Power Generation, Part IIA (3 years)

2023, 2019, 2017 **Laboratory Demonstration**
Department of Engineering, University of Cambridge
Practical-based teaching: in the laboratory, troubleshooting and guiding students towards applied Engineering insight
- Wing analysis: coupled Euler–boundary layer solver in MATLAB (2023)
- Turboexpander: design, build and test of radial turbomachinery (2019)
- Advanced-cycle Power Generation: thermodynamics in Fortran (2017)

Skills and competencies

Experimental Methods for Aerodynamics and Heat Transfer
- Steady and unsteady aerodynamic measurements: pneumatic and hot-wire probe traverses, fast-response pressure transducers
- Infra-red thermography for transient heat transfer measurements
- Mechanical design of experimental apparatus from scratch

Numerical Methods in Fluid Dynamics
- URANS computations for gas turbine aerodynamic analysis
- Large-scale LES computations up to 700 million nodes of film cooling
- Analytical modelling with lumped-parameter, linear approximations

Technical Computing
- General programming ability in Python, MATLAB, bash, Fortran, LaTeX
- Scripting for data acquisition, analysis, modelling, and presentation
- Development, documentation, and deployment of software
- Experienced Linux user and open-source software enthusiast; author of Python compressible flow library with ∼40 downloads/month

Academic service

Whittle Laboratory Postdoctoral Representative

Fitzwilliam College Postdoctoral Society Vice President (2021)

Reviewer for *Journal of Turbomachinery*, ASME Turbo Expo, European Turbomachinery Conference

Undergraduate admissions interviewer for St. John's College and Fitzwilliam College, University of Cambridge

Referees

Prof. Graham Pullan gp10006@cam.ac.uk 01223 339837
Professor of Aerothermal Engineering, University of Cambridge

Dr. Nick Atkins nra27@cam.ac.uk 01223 337592
Senior Lecturer in Turbomachinery, University of Cambridge