Bradley Boyd

Curriculum Vitae

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Research Experience

2022–2023 **Lecturer/Postdoc**, *Department of Mechanical Engineering, University of Canterbury*, Christchurch, New Zealand
Lecturer for HVAC, Heat Transfer, and Thermodynamics. Researching multiphase flow problems.

2021–2022 **Postdoctoral Researcher**, *Department of Mechanical Engineering, Baylor University*, Waco, Texas, USA
High-Fidelity Modeling: Spray Formation, Evaporation, & Boiling

2019–2021 **Postdoctoral Researcher**, *Department of Mechanical Engineering, Texas A&M University*, College Station, Texas, USA
Development of multiphase code used for simulating transcritical flow problems, **e.g. high-pressure diesel injection**

2015–2018 **Ph.D. in Mechanical Engineering**, *University of Canterbury*, Christchurch, New Zealand
Thesis title: *Numerical modeling of an acoustically-driven bubble: the growth and collapse near a wall*

2011–2015 **BE(Hons) Mechanical Engineering 1st Class Honours**, *University of Canterbury*, Christchurch, New Zealand

Research Interests

• Computational fluid dynamics • Multiphase flow • Boiling, Evaporation, & Cavitation • Atomization and sprays • High performance computing

Publications

Journal Articles

2023 **Bradley Boyd**, Sid Becker, & Yue Ling, *Simulation and modeling of the vaporization of a freely moving and deforming drop at low to moderate Weber numbers*, International Journal of Heat and Mass Transfer, 124735, 2023

2023 **Bradley Boyd**, Yue Ling, *A consistent volume-of-fluid approach for direct numerical simulation of the aerodynamic breakup of a vaporizing drop*, Computers & Fluids, 105807, 2023

2021 Bo Zhang, **Bradley Boyd**, Yue Ling, *Direct numerical simulation of compressible interfacial multiphase flows using a mass-momentum-energy consistent volume-of-fluid method*, Computers & Fluids, 105267, 2021

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *A numerical study of the transcritical shock-droplet interaction*, Physical Review Fluids, 6 (11) 113601, 2021

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *A diffuse-interface method for reducing spurious pressure oscillations in multicomponent transcritical flow simulations*, Computers & Fluids, 104924, 2021

2020 **Bradley Boyd**, Sergey A. Suslov, Sid Becker, Andrew D. Greentree, Ivan S. Maksymov, *Beamed UV sonoluminescence by aspherical air bubble collapse near liquid-metal microparticles*, Scientific Reports - Nature, 10 (1) 1501, 2020

2019 **Bradley Boyd**, Sid Becker, *Numerical modelling of the acoustically-driven growth and collapse of a cavitation bubble near a wall*, Physics of Fluids, 31 (3) 032102, 2019

2018 **Bradley Boyd**, Sid Becker, *Numerical modelling of an acoustically-driven bubble collapse near a solid boundary*, Fluid Dynamics Research, 50 (6) 065506, 2018

2017 Finbar Argus, **Bradley Boyd**, Sid Becker, *Electroporation of tissue and cells: a three-equation model of drug delivery*, Computers in Biology and Medicine, 84 226–234, 2017

2016 **Bradley Boyd**, Sid Becker, *Macroscopic modeling of in vivo drug transport in electroporated tissue*, Journal of Biomechanical Engineering, 138 (3), 2016

Conference Articles

2023 **Bradley Boyd**, Sid Becker, Yue Ling, *Aerodynamic drop breakup suppression due to vaporization*, Proceedings of the 9th World Congress on Mechanical, Chemical, and Material Engineering, Brunel University, London, United Kingdom

2023 **Bradley Boyd**, Sid Becker, Yue Ling, *Simulation and modeling for the vaporization of a freely moving drop at moderate Weber numbers*, ASME International Mechanical Engineering Congress and Exposition

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *Shock wave interaction with a transcritical fuel droplet*, International Conference on Liquid Atomization and Spray Systems (ICLASS)

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *Numerical method for reducing spurious pressure oscillations in transcritical flow simulations*, International Conference on Liquid Atomization and Spray Systems (ICLASS)

2015 **Bradley Boyd**, Sid Becker, *Modeling of in vivo tissue electroporation and cellular uptake enhancement*, IFAC-PapersOnLine

Book Chapters

2016 **Bradley Boyd**, Sid Becker, *Simulation of the ultrasound-induced growth and collapse of a near-wall bubble*, IUTAM Symposium on Recent Advances in Moving Boundary Problems in Mechanics, 2018

Seminars & Guest Lectures

2023 **Bradley Boyd**, *Direct numerical simulation of aerodynamic breakup of a vaporizing drop*, Computational and Applied Mechanical Analysis (ENME302), Department of Mechanical Engineering, University of Canterbury, Christchurch, New Zealand
Guest Lecture

2023 **Bradley Boyd**, *Aerodynamic drop breakup suppression due to vaporization*, Department of Mechanical Engineering, University of Canterbury, Christchurch, New Zealand
Department Seminar

2022 **Bradley Boyd**, *Direct numerical simulation of aerodynamic breakup of a vaporizing drop*, Computational and Applied Mechanical Analysis (ENME302), Department of Mechanical Engineering, University of Canterbury, Christchurch, New Zealand
Guest Lecture

Conference Videos

2022 **Bradley Boyd**, Yue Ling, *Direct numerical simulation of aerodynamic breakup of a vaporizing drop*, Gallery of Fluid Motion, 75th Annual Meeting of the APS Division of Fluid Dynamics, Indianapolis, Indiana, USA

2020 **Bradley Boyd**, Dorrin Jarrahbashi, *Shock wave interaction with a near-critical fuel droplet*, Gallery of Fluid Motion, 73th Annual Meeting of the APS Division of Fluid Dynamics, Chicago, Illinois, USA

2018 **Bradley Boyd**, Sid Becker, *Simulation of the acoustically-driven growth and collapse of a cavitation bubble near a wall*, Gallery of Fluid Motion, 71st Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, Georgia, USA

2017 **Bradley Boyd**, Sid Becker, *Simulation of the acoustically-driven growth and collapse of a cavitation bubble near a wall*, Gallery of Fluid Motion, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, Colorado, USA

Conference Contribution

2023 **Bradley Boyd**, *Direct numerical simulations of vaporizing drops at moderate Weber numbers*, Basilisk Monthly Meeting www.basilisk.fr, Paris, France
Invited speaker - Oral Presentation

2023 **Bradley Boyd**, Sid Becker, Yue Ling, *Aerodynamic drop breakup suppression due to vaporization*, Proceedings of the 9th World Congress on Mechanical, Chemical, and Material Engineering, London, United Kingdom
Conference Contribution - Oral Presentation

2023 **Bradley Boyd**, Sid Becker, Yue Ling, *Simulation and modeling for the vaporization of a freely moving drop at moderate Weber numbers*, ASME International Mechanical Engineering Congress and Exposition, New Orleans, Louisiana, USA
Conference Contribution - Oral Presentation

2022 **Bradley Boyd**, Yue Ling, *Direct numerical simulation of secondary atomization of a vaporizing drop*, 75th Annual Meeting of the APS Division of Fluid Dynamics, Indianapolis, Indiana, USA
Conference Contribution - Conference Abstract and Oral Presentation

2021 **Bradley Boyd**, Yue Ling, *Droplet vaporization during aerodynamic deformation and breakup*, The Bluebonnet Symposium on Thermal-Fluid Sciences, Dallas, Texas, USA
Conference Contribution - Conference Abstract and Oral Presentation

2021 **Bradley Boyd**, Prajesh Jangale, Dorrin Jarrahbashi, *A numerical study of surface tension effects on the break-up behavior of transcritical fuel droplets*, 74th Annual Meeting of the APS Division of Fluid Dynamics, Phoenix, Arizona, USA
Conference Contribution - Conference Abstract and Oral Presentation

2021 **Bradley Boyd**, Yue Ling, *Numerical modeling of interfacial two-phase flows with phase change*, 74th Annual Meeting of the APS Division of Fluid Dynamics, Phoenix, Arizona, USA
Conference Contribution - Conference Abstract and Oral Presentation

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *Shock wave interaction with a transcritical fuel droplet*, International Conference on Liquid Atomization & Spray Systems (ICLASS), The University of Edinburgh
Conference Contribution - Conference Paper and Oral Presentation

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *Numerical method for reducing spurious pressure oscillations in transcritical flow simulations*, International Conference on Liquid Atomization & Spray Systems (ICLASS), The University of Edinburgh
Conference Contribution - Conference Paper and Oral Presentation

2021 **Bradley Boyd**, Dorrin Jarrahbashi, *Simulation of the transcritical shock-droplet interaction*, 2021 NETL Multiphase Flow Science Workshop
Conference Contribution - Conference Abstract and Oral Presentation

2020 Dorrin Jarrahbashi, **Bradley Boyd**, *Simulation of a Shock wave Impacting a Near-critical Fuel Droplet*, 73th Annual Meeting of the APS Division of Fluid Dynamics, Chicago, Illinois, USA
Conference Contribution - Conference Abstract and Oral Presentation

2020 **Bradley Boyd**, Dorrin Jarrahbashi, *Multicomponent Near-critical Flow Simulations: Reducing Spurious Pressure Oscillations*, 73th Annual Meeting of the APS Division of Fluid Dynamics, Chicago, Illinois, USA
Conference Contribution - Conference Abstract and Oral Presentation

2020 **Bradley Boyd**, Dorrin Jarrahbashi, *A diffuse-interface method for reducing spurious pressure oscillations in transcritical multiphase and multi-species flow problems*, 31st Annual Conference on Liquid Atomization and Spray Systems 2020, Madison, Wisconsin, USA
Conference Contribution - Conference Abstract and Oral Presentation

2019 **Bradley Boyd**, Sergey Suslov, Sid Becker, Andrew Greentree, Ivan Maksymov, *UV-plasmonic germicidal radiation beams enabled by sonoluminescence of air bubbles near liquid-metal particles*, Biophotonics Australasia, Melbourne, Australia
Conference Contribution - Conference Abstract and Oral Presentation

2019 Sid Becker, **Bradley Boyd**, *The acoustically-driven expansion and collapse of a near-wall bubble*, 72th Annual Meeting of the APS Division of Fluid Dynamics, Seattle, Washington, USA
Conference Contribution - Conference Abstract and Oral Presentation

2018 **Bradley Boyd**, Sid Becker, *Simulation of the ultrasound-induced growth and collapse of a near-wall bubble*, Recent Advances in Moving Boundary Problems in Mechanics, IUTAM, Christchurch, New Zealand
Conference Contribution - Conference Paper and Oral Presentation

2017 **Bradley Boyd**, Sid Becker, *Simulation of the ultrasound-induced growth and collapse of a near-wall bubble*, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, Colorado, USA
Conference Contribution - Conference Abstract and Oral Presentation

2017 **Bradley Boyd**, Sid Becker, *Simulation of the ultrasound-induced bubble collapse near a rigid boundary*, Fluids in New Zealand (FiNZ), Christchurch, New Zealand
Conference Contribution - Conference Abstract and Oral Presentation

2015 **Bradley Boyd**, Sid Becker, *Modeling of In Vivo Tissue Electroporation and Cellular Uptake Enhancement*, 1st World Congress on Electroporation (WC2015), Portoroz, Slovenia
Conference Contribution - Conference Paper and Oral Presentation

2015 **Bradley Boyd**, Sid Becker, *Modeling of In Vivo Tissue Electroporation and Cellular Uptake Enhancement*, 9th IFAC Symposium on Biological and Medical Systems (BMS), Berlin, Germany
Conference Contribution - Conference Paper and Oral Presentation

2015 **Bradley Boyd**, Sid Becker, *Modeling of In Vivo Tissue Electroporation and Cellular Uptake Enhancement*, OMICS World Drug Delivery Summit, Houston, USA
Conference Contribution - ePoster Presentation

2015 **Bradley Boyd**, Sid Becker, *Modeling of In Vivo Tissue Electroporation and Cellular Uptake Enhancement*, Health Research Society of Canterbury 2015 Poster Expo, Christchurch, New Zealand
Conference Contribution - Poster Presentation

2015 **Bradley Boyd**, Sid Becker, *Theoretical modelling of in vivo skin electroporation: degree of electroporation and mass transfer enhancement*, Fluids in New Zealand (FiNZ), Christchurch, New Zealand
Conference Contribution - Conference Abstract and Oral Presentation

2014 **Bradley Boyd**, Sid Becker, *Theoretical modelling of in vivo skin electroporation: degree of electroporation and mass transfer enhancement*, D4: Devices for Diagnostics and Drug Delivery, Dunedin, New Zealand
Conference Contribution - Poster Presentation

Grant Applications/Contributions

2023 **Marsden Fund - Royal Society of New Zealand - PI ~360k NZD**, *Vaporizing a cloud of liquid drops for green fuel combustion*, Unsuccessful

2023 **National Science Foundation (NSF) - Contribution (PI - Dorrin Jarrahbashi) ~500k USD**, *Bottom-up understanding of liquid breakup at supercritical conditions*, ACCEPTED

2022 **Marsden Fund - Royal Society of New Zealand - AI ~800k NZD**, *Barrier Breaking Bubbles Shine Bright: The Physics of Acoustic Sonoluminescent Lensing of the Bio- Membrane*, Unsuccessful

2022 **Office of Naval Research (ONR) - Contribution (PI - Dorrin Jarrahbashi) ~500k USD**, *Resolving shock-driven droplet breakup at hypersonic conditions*, ACCEPTED

2022 **Texas Advanced Computing Center (TACC) project application**, *18,000 service units on Stampede2*

2022 **New Zealand eScience Infrastructure (NeSI) project application**, *6,000 service units on Maui*

Awards

2023 Best Paper Award at the 10th International Conference on Heat Transfer and Fluid Flow (HTFF 2023), *Brunel University, London, United Kingdom*

2019 University of Canterbury Open Access Publishing Fund Award: Nature Scientific Reports

2019 College of Engineering Publishing Scholarship

2017 Best Student Talk in Session at the Fluids in New Zealand Conference

2016 Certificate of Proficiency Vice Chancellor's Excellence Award

2015 Ph.D. funded by the Royal Society of New Zealand's Marsden Fund

Teaching Experience

2023 – 2023 **Lecturing**, *ENME 315*, University of Canterbury, Co-lecturing Heat Transfer (compulsory course for Mechanical Engineering)

2023 – 2023 **Lecturing**, *ENME 215*, University of Canterbury, Co-lecturing Engineering Thermodynamics (compulsory course for Mechanical Engineering)

2022 – 2023 **Lecturing and Course Coordinator**, *ENME 465*, University of Canterbury, Lecturing an course coordination of an undergraduate elective on Heating Ventilation and Air Conditioning (HVAC) Engineering

2022 – 2022 **Lecturing**, *CFD ME 4337/5343*, Baylor University, Co-lecturing a graduate course on computation fluid dynamics

2015 – 2017 **Teaching assistant**, *Thermodynamics and Heat Transfer*, University of Canterbury
Acted as a teaching assistant for a third year engineering class on Thermodynamics and Heat Transfer (ENME305).

2017 **Teaching assistant**, *Thermodynamics*, University of Canterbury
Acted as a teaching assistant for a second-year engineering class on Thermodynamics (ENME215)

2016 **Teaching assistant**, *Fluid Mechanics*, University of Canterbury
Acted as a teaching assistant for a third-year engineering class on Fluid Mechanics (ENME304)

Academic service

2023–2023 **Student engagement working group**, *University of Canterbury*

2022–2021 **Treasurer**, *Baylor University Postdoc Association*

Reviewer for Journals

2022–2023 **Computers & Fluids**

2022–2023 **International Journal of Multiphase Flow**

2019–2023 **Physics of Fluids**

Community Engagement

2021 Mahmood Taofiqhasan, Yue Ling, **Bradley Boyd**, *Supercomputer Modeling of Sprays: from a sneeze to jet engines!*, Sci'Em Science Day in the Mayborn Museum

2015 Mitchell Page, Paul Docherty, **Bradley Boyd**, *Using advanced mathematical processes to aid sports performance*, Invited to give a presentation to Future Problem Solvers in the field of 'Enhancing Human Performance', Canterbury, New Zealand
Oral Presentation

Project Supervision

2023 Ben Netherclift, Joseph Chamberlain, Matthew Highsted, Lachlan Wells, *Motorbike 50cc land speed record*, Engineering Final Year Project, University of Canterbury
Supervisor

2021 Mahmood Taofiqhasan, **Bradley Boyd**, Yue Ling, *Effects of Reynolds number on Aerobreakup of Viscous Drops*, Ph.D., Baylor University
Co-Supervisor

2021 Prajesh Jangale, **Bradley Boyd**, Dorrin Jarrahbashi, *A numerical study of surface tension effects on the break-up behavior of transcritical fuel droplets*, Ph.D., Texas A&M University
Co-Supervisor

2016 Finbar Argus, **Bradley Boyd**, Sid Becker, *Electroporation of tissue and cells: A three-equation model of drug delivery*, Summer Research Scholar, University of Canterbury
Co-Supervisor

2015 Mitchell Page, Paul Docherty, **Bradley Boyd**, *Mechanical and Mechatronic design of a rig to alter sports ergonomics for optimal performance*, Summer Research Scholar, University of Canterbury
Co-Supervisor

Software development

Developer *DIMP* (Diffuse-Interface Multiphase) flow solver (C++)

Developer *Ballistics Buddy* (iOS & Android)

Contributor *Basilisk* (basilisk.fr) flow solver

References

Dr. Sid Becker
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Dr. Dorrin Jarrahbashi
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