David Craig Penner

Curriculum Vitae

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My research is focused on investigating, and potentially improving, the properties of high-order generalized summation-by-parts operators and methods in the context of problems of increasing practical relevance, for example, fluid flow problems governed by the compressible Navier-Stokes equations.

Education

2016/9–present **University of Toronto Institute for Aerospace Studies**, *Toronto*, ON.
Ph.D., Aerospace Engineering, 2022 (Expected)
Advisor: Professor David W. Zingg
Direct transfer from M.A.Sc. to Ph.D.

2011/9–2016/5 **University of Saskatchewan**, *Saskatoon*, SK.
B.Sc., Mechanical Engineering, May 2016
Great Distinction

Experience

Research

2016/9-present **Graduate Student Researcher**, *University of Toronto*, Toronto, ON.
Project: Development and investigation of efficient high-order generalized summation-by-parts operators for computational fluid dynamics
Advisor: Professor David W. Zingg

2014/5–2014/8 **Undergraduate Student Researcher**, *University of Saskatchewan*, Saskatoon, SK.
Project: Investigate the effect of Chromium on diamond deposition on ferrous substrates using microwave plasma chemical vapor deposition
Advisor: Professor Qiaoqin Yang

Industry

2015/5–2015/8 **Student Field Engineer**, *PCL Construction*, Regina, SK.
- Created a set of interactive, electronic construction drawings
- Supervised and directed subcontractors
- Received the highest student performance rating upon completion of work term

2013/5–2013/8 **Engineering Technologist**, *Ground Engineering Consultants Ltd.*, Regina, SK.
- Conducted concrete sampling and concrete cylinder strength testing
- Performed foundation inspections
- Completed topographic surveys

2016/5–2016/8 **Farm Hand**, *Schiller Organics*, Regina, SK.
- Completed construction projects (carpentry and sheet metal)
- Operated and maintained heavy farm machinery
- Completed welding projects

Scholarships, honours, and awards

2020/9–2021/8	Ontario Graduate Scholarship	15 000 CAD
2017/9–2020/8	NSERC Alexander Graham Bell Doctoral Scholarship	105 000 CAD
2018/7	International Summer School Scholarship, Beijing, China	9000 CNY
2017/9–2020/1	University of Toronto Fellowship	34 000 CAD
2017/6	International HPC Summer School Scholarship, Boulder, Colorado	935 CAD
2016/9–2017/8	NSERC Alexander Graham Bell Master's Scholarship	17 500 CAD
2016/9	Mary H. Beatty Fellowships	5000 CAD
2016/5	University of Saskatchewan M.Sc. Scholarship (Declined)	17 000 CAD
2016/3	Most Innovative Mechanical Engineering 4^{th} Year Capstone Design Project	
2016/3	3^{rd} place – Most Innovative 4^{th} Year Capstone Design Project	75 CAD
2016/1	Nortek Air Solutions Canada Award	2000 CAD
2016/1	Douglas Durie Memorial Fund	1000 CAD
2016/1	University of Saskatchewan Scholarships	3000 CAD
2015/1	Douglas Durie Memorial Fund	2000 CAD
2015/1	W. R. (Buck) Staples Scholarship	2300 CAD
2015/1	University of Saskatchewan Scholarships	3000 CAD
2014/5–2014/8	NSERC Undergraduate Student Research Award	5625 CAD
2012/9–2016/5	Dean's Honour Roll in Engineering	
2012/9–2013/4	David Dube and Heather Ryan Huskies Men's Football Award	4300 CAD
2011/9–2012/4	Huskie Football Foundation Awards	4000 CAD

Journal publications (refereed)

[2] D. A. Craig Penner and D. W. Zingg, "Superconvergent Functional Estimates from Tensor-Product Generalized Summation-by-Parts Discretizations in Curvilinear Coordinates," *Journal of Scientific Computing*, vol. 82, Feb. 2020. DOI: 10.1007/s10915-020-01147-7.

[1] X. Sun, H. Ma, L. Yang, M. Sanchez-Pasten, D. Craig Penner, Y. Li, and Q. Yang, "Metal Dusting, Carburization and Diamond Deposition on Fe-Cr Alloys in CH4-H2 Plasma Atmospheres," *Corrosion Science*, vol. 98, pp. 619–625, Sep. 2015. DOI: 10.1016/j.corsci.2015.06.001.

Conference proceedings (refereed)

[2] D. A. Craig Penner and D. W. Zingg, "Generalized Summation-by-Parts Methods: Coordinate Transformations, Quadrature Accuracy, and Functional Superconvergence," in *AIAA Aviation 2019 Forum*, Dallas, Texas: American Institute of Aeronautics and Astronautics, Jun. 2019. DOI: https://doi.org/10.2514/6.2019-2952.

[1] D. A. Craig Penner and D. W. Zingg, "High-Order Artificial Dissipation Operators Possessing the Summation-by-Parts Property," in *2018 Fluid Dynamics Conference*,

Atlanta, Georgia: American Institute of Aeronautics and Astronautics, Jun. 2018. DOI: 10.2514/6.2018-4165.

Presentations (excluding the above proceedings)

[3] D. A. Craig Penner, A. L. Marchildon, K. J. Mattalo, S. Shadpey, and D. W. Zingg, "Novel High-Order Summation-by-Parts Methods for Computational Fluid Dynamics," Poster presentation, *1st Computational Science and Engineering Symposium*, University of Toronto Institute for Aerospace Studies, Toronto, Ontario, Canada, May 2019.

[2] D. A. Craig Penner, "High-Order Artificial Dissipation Operators Possessing the Summation-by-Parts Property," Oral presentation, *2018 International Graduate Summer School in Aeronautics and Astronautics*, Beihang University, Beijing, China, Jul. 2018.

[1] D. A. Craig Penner, "Development and Investigation of Efficient High-Order Generalized Summation-by-Parts Operators for Computational Fluid Dynamics," Oral presentation, *2017 International High-Performance Computing Summer School*, University of Colorado Boulder, Boulder, Colorado, United States of America, Jun. 2017.

Teaching

Fall 2017 – 2018 – 2019 – 2020 **Graduate Teaching Assistant**, Fundamentals of Computational Fluid Dynamics (AER 1316H), University of Toronto.
Instructor: Professor David W. Zingg
Responsibilities: marking, guest lecturer

Mentoring

Assisted in the supervision of the following students

2018/5–2018/8 **Alireza Razavi**, Bachelor of Applied Science, University of Toronto.
Project: Applying optimized summation-by-parts operators to cut cell nodal distributions

2018/5–2018/8 **Edward (Jun Tai) Luo**, Bachelor of Applied Science, University of Toronto.
Project: Optimal boundary closures for high-order artificial dissipation operators satisfying the summation-by-parts property

Computer skills

underline denotes extensive use

Languages	Fortran, MATLAB, Python, C++	Environments	UNIX terminal, Windows
Software	SolidWorks, ICEM CFD, Tecplot	Microsoft	Excel, Word, PowerPoint

Other activities

2011/9–2013/8 **Athlete**, *University of Saskatchewan Huskies Men's Football Team*, Saskatoon, SK.
Competed with the University of Saskatchewan Football Team for two years.