

# Proceedings of Manitoba's Undergraduate Science and Engineering Research

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## About PMUSER

*Proceedings of Manitoba's Undergraduate Science and Engineering Research (PMUSER)* is an open-access refereed journal that is published annually and hosted by the University of Manitoba. The journal accepts research or review manuscripts written by undergraduate students from any science or engineering related faculty or manuscripts on any topic concerning or related to science or engineering. Upon submission, each manuscript undergoes a double blind peer-review process by two undergraduate/graduate students from a pool associated with the respective research area. Our mission is to provide opportunities for student communities to explore the frontiers of undergraduate research and add additional value and learning opportunities to students' degree programs through rigorous exploration, analysis, and presentation.

## Aims & Scope

The focus of *PMUSER* is three fold: author, reviewer, editor. Through preparing and revising a manuscript, students are recognized for their research, have an opportunity for out-of-classroom learning, and further develop communication skills. Through learning the role of a peer-reviewer and reviewing manuscripts, students learn to critically evaluate the scientific literature and to critique ideas in the broader world. Through the editorial board, an interdisciplinary team arises to provide mentorship to undergraduate students and valuable leadership and teamwork skills. The three prongs of our focus unite in preparing students for careers in science or beyond, and the stepping stones to get there. Available online: <http://ojs.lib.umanitoba.ca/pmuser/about/editorialPolicies#focusAndScope>.

## Image Credits

Evan Tremblay, cover  
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Chloé Warret Rodrigues, pages 2 & 3, Cover Art runner-up

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## Instructions for Authors

Undergraduate authors are encouraged to submit research or review articles in or related to any science or engineering discipline. Detailed instructions are available online: <http://ojs.lib.umanitoba.ca/pmuser/about/submissions>.

## Peer-Reviewers

*PMUSER*'s peer-reviewers apply each year and are primarily graduate and undergraduate students, with expertise supplemented by faculty. Training is provided through a University of Manitoba Co-Curricular Record certified workshop. Those interested in reviewing for the journal should email the editor-in-chief for application forms. Peer-reviewers for Volume 4 were: John P. Aguilar, Sarah Arnold, Jun Bae, Kevin R. Bairos-Novak, Tom Booth, Jennifer Doering, Keri Everitt, Kristen Fleet, Andrew Hogan, Kat Kratzer, Janelle Boram Lee, Duc Minh Nguyen, Franklin Ogidi, Michaela Palmer, Davinder Partola, and Rani Ramachandran.

## About the Cover



The cover features the the 2018 Cover Art Contest winner, *Anabasis* by Evan Tremblay.

*"The image, Anabasis, is an interpretation of the journey of discovery, represented as the piercing of the circle of the world.*

*The physical and biological forces explored by the papers in this volume of PMUSER are shown abstracted, blurring the line between orbits and cell walls, on a field of either the sky or the deep sea.*

*The pierced wall of the circle speaks to the tearing-through of mystical borders to knowledge through scientific inquiry, giving motion and direction to what would otherwise be a static, theoretical existence. The form invites contemplation: it inspires questioning."*

The back cover continues Tremblay's exploration of this theme.

