



# PMUSER

Proceedings of Manitoba's Undergraduate Science and Engineering Research

## About

The Proceedings of Manitoba's Undergraduate Science and Engineering Research journal is an online open-access refereed journal published annually and hosted by the University of Manitoba. The journal accepts research or review manuscripts written by undergraduate students from any science related faculties including, but not limited to Engineering, Science, Human Ecology, Environment, Earth, and Resources, Agriculture and Food Sciences, Nursing and Medicine. Upon submission, each manuscript undergoes a blind peer-review process by two undergraduate students from a pool associated with the respective research area.

## Focus and Scope

The focus of the Proceedings of Manitoba's Undergraduate Science and Engineering Research journal is three fold. The circulation of a peer-reviewed undergraduate journal will provide a chance for students to receive recognition for their research in a wide range of scientific disciplines. The undertaking of writing a journal manuscript will further enhance the understanding of the significance of their respective projects in a broader context. This, in turn, will foster a tremendous growth in their intellectual development outside of the classroom setting, and serves as preparation for a career in research.

## Editorial Board

### Editor-in-Chief

Mr. John Titus (Founder)

### Managing Editors

Mr. Wenyang Li (Founder)

Mr. Joshua Titus

### Copy-Editor

Mr. Jonathon Challis, Chemistry, University of Manitoba

### Peer Reviewers

Ms. Carol Nabanoba Musoke, Biosystems Engineering, University of Manitoba

Mr. Emanuelito Tomas, Biochemistry, University of Manitoba

Mr. Dillon Barker, Microbiology, University of Manitoba

Ms. Kristene Cheung, Psychology, University of Manitoba

Ms. Kristen Fleet, Human Nutrition Science, University of Manitoba



# PMUSER

Proceedings of Manitoba's Undergraduate Science and Engineering Research

## Editorial Advisory Board

Dr. Deborah Court (Associate Professor  
Science, University of Manitoba,  
Department of Microbiology)

Dr. Georg Hausner (Associate Professor  
Science, University of Manitoba,  
Department of Microbiology)

Dr. Michael Eskin (Professor/Associate Dean  
Human Ecology, University of Manitoba,  
Faculty of Human Ecology)

Dr. Yvonne Lawley (Assistant Professor  
Plant Science, University of Manitoba,  
Department of Plant Science)

Dr. George Gozho (Instructor Animal  
Science, University of Manitoba,  
Department of Animal Science)

Dr. F. Amara (Associate Professor  
Biochemistry and Medical Genetics,  
University of Manitoba, Faculty of  
Medicine)

Dr. Anne Parker (Associate Professor Design  
Engineer, University of Manitoba, Faculty of  
Engineering)

## Cover Artist

Ms. Danielle Trudeau (University of  
Manitoba, Faculty of Science)

## Special Thanks

Dr. Michele Piercey-Normore (Associate  
Dean of Undergraduate Studies, University  
of Manitoba, Faculty of Science)

Dr. Peter Graham (Associate Dean of  
Research, University of Manitoba, Faculty of  
Science)

Ms. Jan Horner (Coordinator, Collections  
Management, University of Manitoba,  
Elizabeth Dafoe Library)

Ms. Vera Keown (Head, Sciences &  
Technology Library, University of Manitoba)

Ms. Patricia Goss (Marketing &  
Communications, University of Manitoba)

University of Manitoba's Faculty of Science