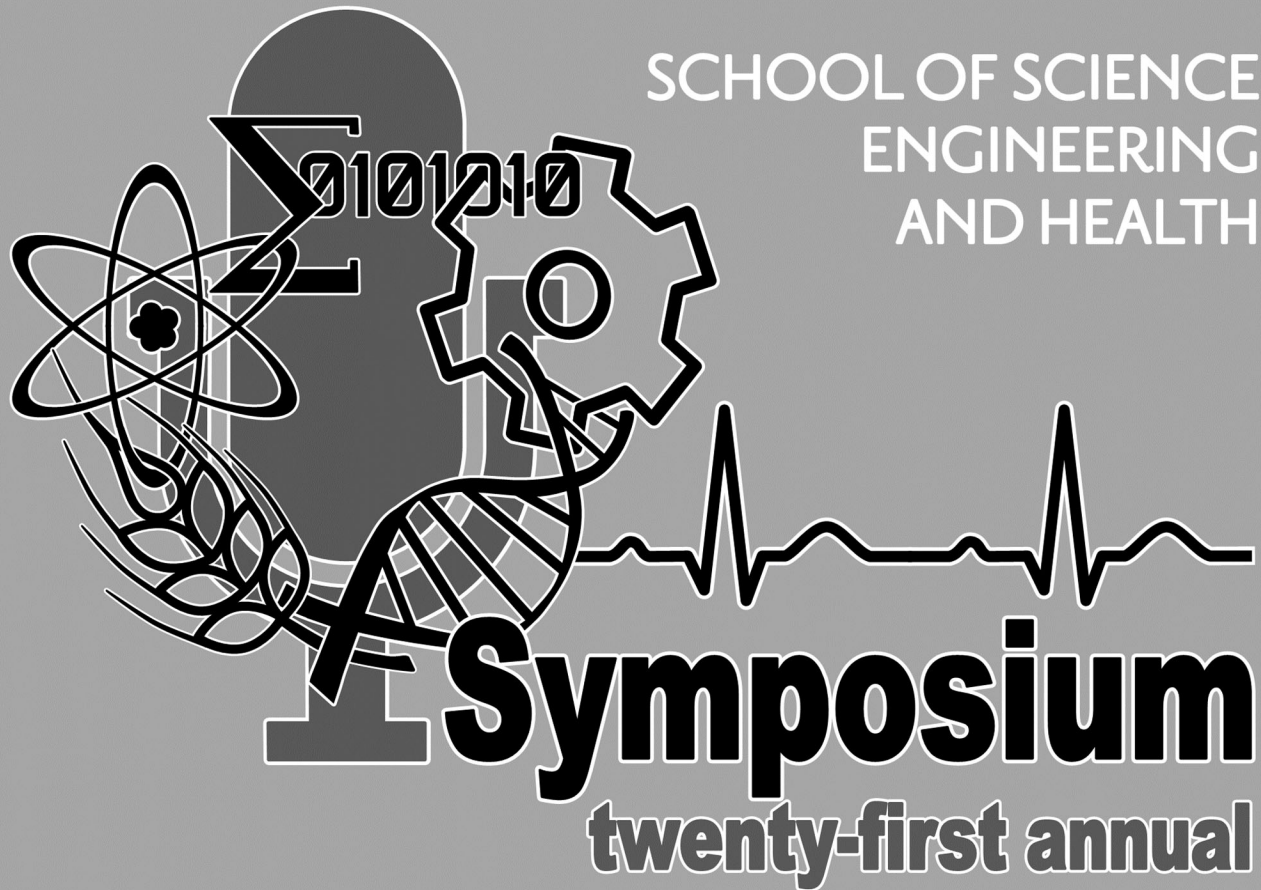


FRIDAY, MAY 3, 2024

**MESSIAH
UNIVERSITY**



SCHOOL OF SCIENCE
ENGINEERING
AND HEALTH

Symposium
twenty-first annual

PROGRAM

A Word from the Dean

We in the School of Science, Engineering and Health at Messiah University welcome you to our 21st Annual Symposium.

Please celebrate with our students, staff, and faculty as you hear and see professional presentations that showcase our students' basic and applied research in science and health fields.

The outcomes of scientific research expand intellectual understanding and have tremendous impact on quality of life, environmental health, and human flourishing.

We warmly welcome you as guests for the day.

Angela C. Hare, Ph.D.

Associate Provost

Dean of the School of Science, Engineering and Health

Professor of Mathematics

Special thanks to...

Jennifer Good, Administrative Assistant to the Dean of the School of Science, Engineering and Health, for coordination of room reservations, advertising, catering, and hospitality.

John Harms, Ph.D., Department of Biological Sciences, for management of Symposium communication, layout and scheduling of the Symposium, and program design.

Timothy Van Dyke, Ph.D., Department of Engineering, for coordination of Engineering submissions, and development and maintenance of the web-based Symposium site.

Scott Weaver, D.P.S., for development of the Symposium Project Registration and Management system (SymPRM) used to collect and organize submissions to the Symposium.

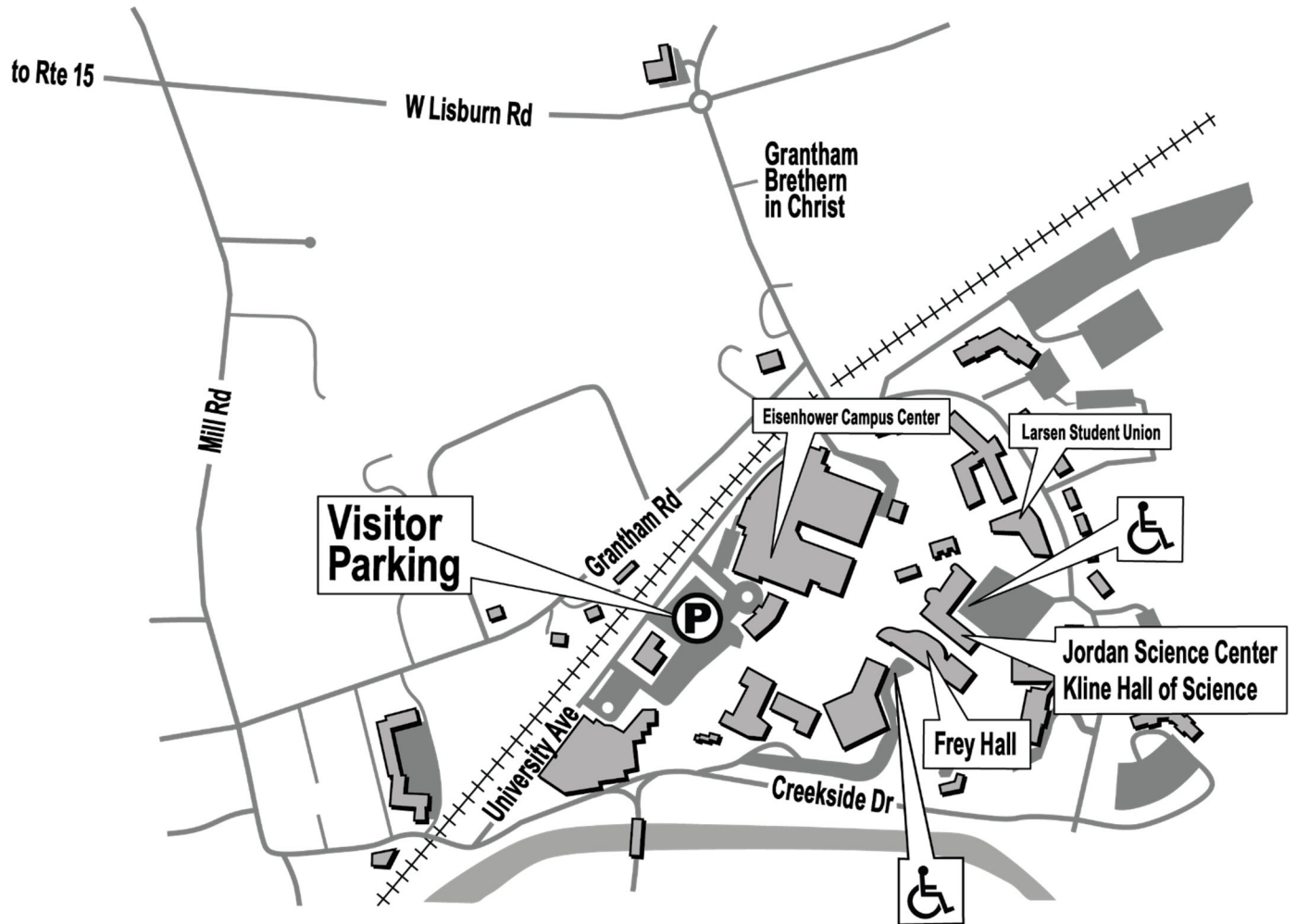
Visit https://huggs.messiah.edu/seh_symposium
to view abstracts accompanying each presentation

WELCOME to the 21st Annual Symposium of the School of Science, Engineering and Health.

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Messiah University



Welcome to Messiah University!

Visitor Parking: Parking is provided in the main Visitor Parking lot (VV) accessed from University Avenue, between Old Main and the Eisenhower Campus Center. Parking tags are not required during the Symposium. While designated handicapped parking is distributed throughout campus, spots closest to Symposium venues are available in the employee parking lots behind the Jordan Science Center (WW) and in the circle at the heart of campus (YY).

Dining facilities: The Lottie Nelson Dining Hall (upper level) and The Falcon (lower level; soup, paninis, salads) are located in the Eisenhower Campus Center. The Union Café (pizza, grill, wraps, salads) is located in the Larsen Student Union.

Using this Booklet

This **Program and Abstract booklet** provides times, locations and titles for all presentations in the Symposium. A consolidated “**Schedule at a Glance**” (page 4) summarizes the schedule of all Oral Presentations and Poster Presentations (page 6).

Presentation Number: Each presentation has been assigned a unique Presentation Number. This number is used throughout the booklet to facilitate cross-referencing.

Authorship: All contributing co-authors and mentors are listed in the Program. The name of each **presenting author** is in **bold font**. An **Index of Authors** at the end of the booklet (page 30) lists the names of all authors alphabetically with the number(s) of each presentation on which each is included.

Program & Symbols: Presentations are organized in discipline-specific sessions. Throughout the Program and “**Schedule at a Glance**,” unique icons (see box at right) indicate the discipline of each presentation.











Abstracts: Abstracts for each oral and poster presentations in the Symposium are provided on our accompanying website:
https://huggs.messiah.edu/seh_symposium

Acknowledgments: All faculty mentors, external mentors and collaborators, and nursing professionals are recognized. Sources of financial and material support are also listed (page 29) with corresponding presentation numbers.





Authorship Legend:

- bold** Presenting author
- + Research or project mentor
- ‡ Off-campus contributor

Discipline Categories:

-  Biopsychology
-  Cellular & Molecular Biology
-  Chemistry & Biochemistry
-  Computer & Information Science
-  Engineering
-  Exercise Science
-  Mathematics
-  Nursing
-  Organismal & Ecological Biology
-  Physics

Additional Symbols:

-  This oral presentation is accompanied by a poster
-  This poster is accompanied by an Oral Presentation
-  This project was supported by the Steinbrecher Undergraduate Summer Research Program
-  This project was supported by the Collaboratory for Strategic Partnerships and Applied Research

SCHEDULE AT A GLANCE

**Alexander Auditorium
(Frey 110)**



Mathematics & Physics

- 9:00 1 Σ Graff
- 9:20 2 Σ Nichols
- 9:40 3 Σ Durika
- 10:00 4 Anthony
- 10:20 5 Griffith
- 10:40 6 Σ Heise
- 11:00 7 Σ Hildebeitel
- 11:20 8 Σ Schneider
- 11:40 9 Σ Lim

**Alexander Auditorium
(Frey 110)**



Engineering I

- 1:00 10 Allbee, Binko, Gehenio, Ross
- 1:30 11 Bitler, Ling, Magness, Roca Ruano
- 2:00 12 Gates, Kapp, Kline
- 2:20 13 Regula, Bucher
- 2:40 14 Harro, Gingerich, Jaiyesimi, Lacayo, Touhey

Frey 150

Engineering II

- 15 Lim, Koehnke, Price, Rijo
- 16 Campbell, Bisbort, Jaloszynski, Wood
- 17 Hargrove, Wood
- 18 Ferrin, Herman
- 19 Huang, Golub, Green, Smith-Cassidy

Frey 145

Mathematics

- 1:00 20 Σ Herrlin
- 1:20 21 Σ Hurley
- 1:40 22 Σ Kerchner
- 2:00 23 Σ Stoltzfus
- 2:20 24 Σ Lapp
- 2:40 25 Σ Calisti



Poster Session

Jordan Science Center 3:00-4:00



Engineering III

- 4:00 41 Friend, Wyrick
- 4:20 42 Clemmer, Green
- 4:40 43 Ellis, Pizzuti, Siegrist
- 5:00 44 Holley, Mendoza, Sauder, Settupane

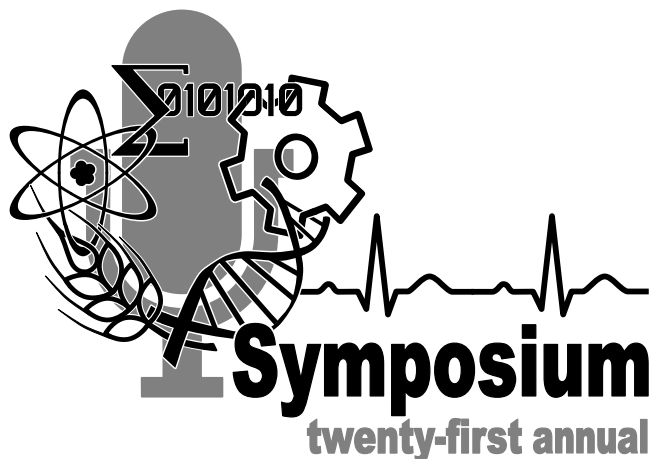
Engineering IV

- 45 Brink, Faragallah, Smith
- 46 Clark, Dressler
- 47 Shea, Landis
- 48 Egelkamp, Collins, Oyler, Sweeton

Computing

- 4:00 49 Calisti, Truex, Brenneis, Sinsel
- 4:20 50 Shoul, McGillen, Clarke, Phillips
- 4:40 51 Hubley, Muresan

Oral Presentations



SCHEDULE AT A GLANCE

Kline 120

Jordan 159






Jordan 161













Natural Sciences I

Natural Sciences II

Natural Sciences III

- 1:00 26  Ramsey
- 1:20 27  Condon
- 1:40 28  Azar
- 2:00 29  Casey
- 2:20 30  Grove

- 31  Thurber
- 32  Foster
- 33  Garrett
- 34  Undieh
- 35  Johnson

- 36  Vidzicki
- 37  Myers
- 38  Saxe
- 39  Gonzales
- 40  Richert



Poster Session




Jordan Science Center 2:40-4:00






Natural Sciences IV

Natural Sciences V

Natural Sciences VI

- 4:00 52  McFeaters, Spencer
- 4:20 53  Phillips, Song
- 4:40 54  Touzeau, Aldridge

- 55  Jahraus
- 56  Soerens
- 57  Jones

- 58  Kumi
- 59  Gaston
- 60  Smith



Poster Presentations



Natural Sciences

Hollinger Atrium & Hollinger Lounge; 2:40 – 4:00

26 Ramsey

27 Condon

29 Casey

30 Grove

31 Thurber

32 Foster

33 Garrett

34 Undieh

35 Johnson

36 Vidzicki

40 Richert

56 Soerens

60 Smith

61 Ambrosino

62 Barnes

63 Stougard

64 Zhang

65 Coletti, Lielbriedis, Conrad

66 Fitz

67 Marks

68 Aldridge

69 Michael



Evidence-Based Nursing Care

Hollinger Lounge; 2:40 – 4:00

70 Charles, Feight, Hartman, Leader, Pfau, Ross, Schaefer

71 Crago, DeBruin, Puckett, Stoner, Walker, Zehr

72 Alvarado, Barley, Horcasitas, Koch, Scharfe, Watson

73 Adhikari, Cheong, Ford, Groothoff, Hambright, Mensch, Miller

74 Barnes, Fiero, Lorincz, Lloyd, Moore, Muthoka

75 Cotner, Horst, Keller, Morse, Ramsey, Richards



Engineering

Oakes Museum & Jordan Science Center; 3:00 – 4:00

76 Pettitt, Alunni, Javier

77 Haney, Friedmann, Griffith, Lau, Renner

78 Henry, McAtee, Pryor

79 Heise

80 Burgos, Jean

81 Cottrell, Nitschke-Love

82 Cronauer, Kekic, Sobek

83 Brackman, DeArville, Gaigler, Kreider, Petrovich, Slayton

84 Frazho, Kramer, Kratz

85 Bingaman, Chan, Wong

86 Fasnacht, McIntire, Rouland

87 Hilton, Steele

88 Geiger, Hicks, Sun

89 Foester, Wages

90 Derstine, Martin, Willoughby

91 Leitzel

92 Levan, Van Der Ploog

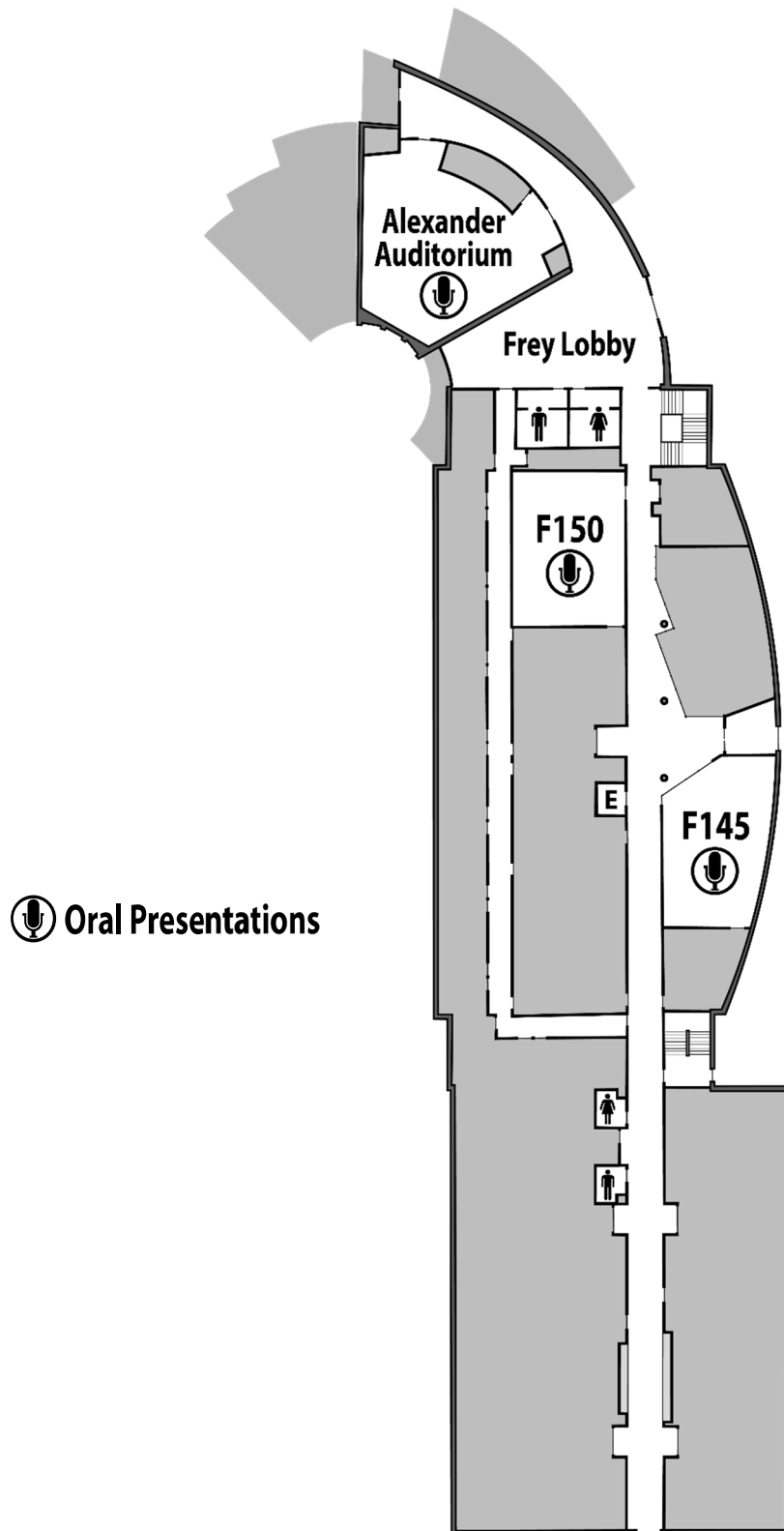
93 Meals, Parks

94 Wu

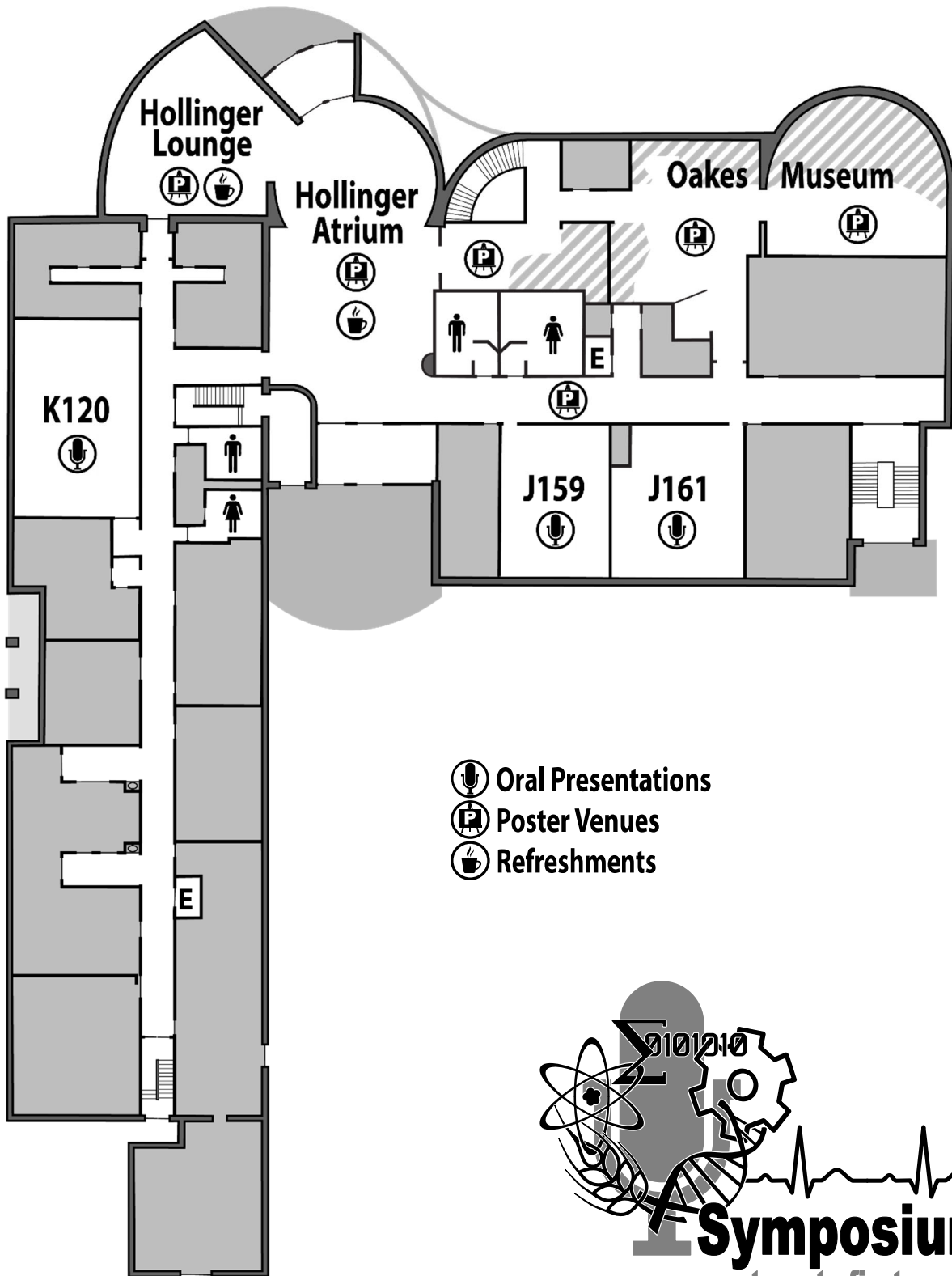
95 Collyer, Frederick, Johnston, Kagarise

SCHEDULE AT A GLANCE

Frey Hall



Jordan Science Center - Kline Hall of Science



Oral Presentations (Morning)

Mathematics & Physics












Alexander Auditorium (Frey 110); 9:00 – 12:00

- 1 9:00 Σ *An Analysis of Athletes' Limitations in Sports*
Brett Graff
- 2 9:20 Σ *Limitations in Mathematics: A Glimpse into Incompleteness*
Hanalee Nichols
- 3 9:40 Σ *Exploration of the 8 Queens Puzzle*
Thomas Durika
- 4 10:00  *Growth and Characterization of Transition Metal Boride Thin Films*
Katie Anthony, William Griffith, Niklas Hellgren[†]
- 5 10:20  *Dark Matter Search with Snipe Hunt Experiment*
William Griffith, Ethan Bolin, Abaz Kryemadhi[†]
- 6 10:40 Σ *Projective Planes and "Spot-It!" Decks*
Callan Heise
- 7 11:00 Σ *Bad Data: How Mathematical Models Can Lead Us Astray*
Skyler Hildebeitel
- 8 11:20 Σ *A Study in the Mathematics of the Enigma Cipher Machine*
Margaret Schneider
- 9 11:40 Σ *Analysis of Covid-19 Data in Malaysia*
Isaac Lim

Oral Presentations (Early Afternoon)

Engineering I







Alexander Auditorium (Frey 110); 1:00 – 3:00

- | | | | | |
|----|------|---|---|---|
| 10 | 1:00 |  | <i>Providing Clean Accessible Water Solutions Around the World</i> Liv Allbee, Nathan Binko, Cassandra Gehenio, Caitlin Ross, Sam Dykes, Candace Forry, Regan Meals, Brayden Parks, Emma Rice, Ray Knepper ^{††} , Michelle Lockwood [†] |   93 |
| 11 | 1:30 |  | <i>This is How We Brew It: Coffee Decaffeination</i> Thomas Bitler, Noah Ling, Lane Magness, Luis Roca Ruano, Aleesa Wu, Thomas Soerens [†] |   94 |
| 12 | 2:00 |  | <i>Land Development in India: Stormwater Mitigation, Roadway, and Sports Court Design</i> Benjamin Gates, Thomas Kapp, Seth Kline, Caleb Hilton, John Steele, Elizabeth Yoho, J Scott Heisey [†] , Michelle Lockwood [†] , Steve Lockwood ^{††} |   87 |
| 13 | 2:20 |  | <i>Development of a Reliable, Low-Cost Wind Turbine Monitoring System</i> Ethan Regula, Justin Bucher, Pj Cronauer, Noah Hege, Turner Kekic, Carlos Rivas, Sage Sobek, Tim Burdett [†] |   82 |
| 14 | 2:40 |  | <i>Modular Mobility Design for Serving New and Ongoing Clients</i> Steven Carpenter, Collin Binford, David Vader [†] |   89 |

Engineering II

Frey 150; 1:00 – 3:00

- | | | | | |
|----|------|---|---|---|
| 15 | 1:00 |  | <i>Embedded Circuit Development for FES-Aided Gait</i> James Lim, Brandon Koehnke, Summer Price, Jaylinne Rijo, Alexa Blagbrough, Callan Heise, Noah Richert, Ryan Schied, Nathaniel Zarate, Ryan Farris [†] |  |
| 16 | 1:30 |  | <i>Mechanical Design and Testing of a Prosthetic Knee for CURE Kenya</i> Paige Campbell, Caleb Bisbort, Nathan Jaloszynski, Cadee Wood, Victoria Burgos, Daniel Jean, Philip Tan [†] |   80 |
| 17 | 2:00 |  | <i>The Electromechanical Design of a Novel Stance Control Orthosis</i> Elizabeth Hargrove, Justin Wood, David Alunni, Emily Javier, Laurel Pettitt, Ryan Farris [†] |   76 |

- | | | | | |
|----|------|---|--|---|
| 18 | 2:20 |  | <i>Kenya Rainwater Collection and Distribution Design</i> Anna Ferrin, Joel Herman , Amy Fasnacht, Zac McIntire, Gus Rouland, Thomas Soerens [†] |   86 |
| 19 | 2:40 |  | <i>Quantifying Force Exertion and Predicting Lifespan of Clubfoot Braces</i> Rachel Huang, Lilia Golub, Clifton Green, Hayward Smith-Cassidy , Hailey Levan, Trent Van Der Ploog, Camilo Giraldo [†] |   92 |



Mathematics






Frey 145; 1:00 – 3:00






- | | | | |
|----|------|----------|---|
| 20 | 1:00 | Σ | <i>Teaching Mathematical Proof throughout the Secondary Curriculum</i> Abigail Herrlin |
| 21 | 1:20 | Σ | <i>The Practical Applications of Mathematics in Business</i> Calli Hurley |
| 22 | 1:40 | Σ | <i>A Mathematical Encryption: Staying Protected by Algebra</i> Grant Kerchner |
| 23 | 2:00 | Σ | <i>Theatre in the Mathematics Classroom</i> Jillian Stoltzfus |
| 24 | 2:20 | Σ | <i>Immunization Strategies and Their Applications in Portfolio Management</i> Joel Lapp |
| 25 | 2:40 | Σ | <i>Turning Stats Into Success: Predicting MLB Wins From Sabermetrics</i> Noah Calisti |



Natural Sciences I

Kline 120; 1:00 – 2:40

- | | | | | |
|----|------|---|---|---|
| 26 | 1:00 |  | <i>Determining the Efficacy of Anti-Fibrotic Treatment on Pancreatic Cancer Metastases</i> Ruby Ramsey , John Harms [†] |  |
| 27 | 1:20 |  | <i>Evaluation of the Growth and Agronomic Performance of Flax Varieties (<i>Linum usitatissimum</i>) in South Central Pennsylvania</i> Sarah Condon , Glafera Janet Matanguihan [†] , Richard Schaeffer [†] |   |

- | | | | | |
|----|------|---|---|---|
| 28 | 1:40 |  | <i>Developing a Protocol for Prolonged Proglumide Treatment of Pancreatic Cancer and Stellate Cells and Determining its Effect on Col1a1 and Col1a2 Expression</i> Michael Azar, John Harms[†] | |
| 29 | 2:00 |  | <i>Isolation, Determination, and Antimicrobial Effectiveness of Berberine-Containing Herbal Extracts</i> Abigail Casey, David Foster[†], Lawrence Mylin[†], Richard Schaeffer[†] |  |
| 30 | 2:20 |  | <i>Investigating the Effects of Membrane-Bound CX3CL1 on Microglial Migration</i> Austin Grove, Jennifer Ness-Myers[†] |  |



Natural Sciences II

Jordan 159; 1:00 – 2:40

- | | | | | |
|----|------|---|---|---|
| 31 | 1:00 |  | <i>Comparison of Produce Yield in Hydroponics and Aquaponics</i> Caleb Thurber, David Foster[†] |  |
| 32 | 1:20 |  | <i>Evaluation of Bacteriophage T4-Neutralizing Antibodies Secreted by Murine Hybridoma Clones</i> Ava Foster, Wei-Jin Lin, Lawrence Mylin[†] |  |
| 33 | 1:40 |  | <i>Optimizing the Reaction Conditions for a Consistent Synthesis of Iron Based Metal Atom Catalysts</i> Makayla Garrett, Seth Burkert[†] |  |
| 34 | 2:00 |  | <i>Dosage Response to Nickel in Arabidopsis thaliana irt1 Mutants</i> Akon Undieh, Michael Shin[†] |  |
| 35 | 2:20 |  | <i>Synthesis and Modification of a Nickel Single-Atom Catalyst for Hydrogenation</i> Aaron Johnson, Seth Burkert[†] |   |



Natural Sciences III
















Jordan 161; 1:00 – 2:40

- 36 1:00  *Assaying the Metal-Specificity of Heme Biosynthesis Enzyme Variants*  
Joseph Vidzicki, Jesse Kleingardner[†]
- 37 1:20  *The Effects of Continuous Flood Flow Restriction on Strength and Fatigue of the Vastus Lateralis*
Grant Myers, Evan Wagaman, Elijah Eade, Grace Hejeebu, H. Scott Kieffer[†]
- 38 1:40  *Non-Biting Midges (Chironomidae) as Bioindicators of Specific Pollutants* 
Nathaniel Saxe, Jeff Erikson[†]
- 39 2:00  *The Influence of Prayer/Meditation on the Autonomic Nervous System and Brain-Derived Neurotrophic Factor*
Rhianna Gonzales, Chase Wilson, Sophia Gray-Baublitz, Kyra Hersh, H. Scott Kieffer[†]
- 40 2:20  *Evaluating Hydrophobic Organic Contamination in Sediment and Benthic Macroinvertebrates in a Pennsylvanian Limestone Spring* 
Caleb Richert, Jeff Erikson[†], Roseann Sachs[†]

Poster Presentations

Natural Sciences

Hollinger Atrium & Hollinger Lounge; 2:40 – 4:00







- 26  *Determining the Efficacy of Anti-fibrotic Treatment on Pancreatic Cancer Metastases* 
Ruby Ramsey, John Harms[†]
- 27  *Evaluation of the Growth and Agronomic Performance of Flax Varieties (*Linum usitatissimum*) in South Central Pennsylvania* 
Sarah Condon, Glafera Janet Matanguihan[†], Richard Schaeffer[†]
- 29  *Isolation, Determination, and Antimicrobial Effectiveness of Berberine-Containing Herbal Extracts* 
Abigail Casey, David Foster[†], Lawrence Mylin[†], Richard Schaeffer[†]
- 30  *Investigating the Effects of Membrane-Bound CX3CL1 on Microglial Migration* 
Austin Grove, Jennifer Ness-Myers[†]
- 31  *Comparison of Produce Yield in Hydroponics and Aquaponics* 
Caleb Thurber, David Foster[†]
- 32  *Evaluation of Bacteriophage T4-Neutralizing Antibodies Secreted by Murine Hybridoma Clones* 
Ava Foster, Wei-Jin Lin, Lawrence Mylin[†]
- 33  *Optimizing the Reaction Conditions for a Consistent Synthesis of Iron Based Metal Atom Catalysts* 
Makayla Garrett, Seth Burkert[†]
- 34  *Dosage Response to Nickel in *Arabidopsis thaliana* irt1 Mutants* 
Akon Undieh, Michael Shin[†]
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- 40  *Evaluating Hydrophobic Organic Contamination in Sediment and Benthic Macroinvertebrates in a Pennsylvanian Limestone Spring* 
Caleb Richert, Jeff Erikson[†], Roseann Sachs[†]

- 56  *Evaluation of a Cell-Based Vaccine Against Pancreatic Cancer* 
Evangeline Soerens, John Harms[†], Lawrence Mylin[†]
- 60  *Mutation of Twitch-2B to Create a Novel FRET In Vivo Biosensor for Transition Metal Ions* 
Sarah Smith, Jesse Kleingardner[†]
- 61  *Evaluating Fibrosis Inhibition in a New Murine Model of Pancreatic Cancer*
Marian Ambrosino, John Harms[†]
- 62  *Designing a Fluorescence Assay to Test the Effectiveness of Stilbenes as PTP1B Inhibitors*
Abigail Barnes, Anne Reeve[†]
- 63  *Virtual Reality and Its Effect on Empathy in Regards to Climate Change*
Kathryn Stougaard, Sydney Sefing, Kaila Davie, Jennifer Thomson[†]
- 64  *Synthesis of Hydroxylated Stilbenes as PTP1B Inhibitors*
Keaidi Zhang, Anne Reeve[†]
- 65  *Effects of Wearable Resistance on Walking and Jogging*
Bryce Coletti, Caitlin Lielbriedis, Jack Conrad
- 66  *Effect of Proglumide on Fibrosis in a Model of Advanced Pancreatic Cancer*
Faith Fitz, John Harms[†]
- 67  *Developing an Appropriate Zinc Oxide Nanoparticle Laboratory Experiment for High School Students* 
Charlotte Marks, Seth Burkert[†]
- 68  *The Genetic Influences of Exercise on Serum Brain-Derived Neurotrophic Factor*
Caleb Aldridge, Bella Touzeau, Ben Van Deusen, Liliana Greer, Sophia Gray-Baublitz, H. Scott Kieffer[†]
- 69  *Dietary Analysis of *Plethodon wehrlei*: A Cryptic Species of Lungless Salamander in Pennsylvania*
Mary Michael, Erik Lindquist[†], Randy Cassell[†]



Evidence-Based Nursing Care





























Hollinger Lounge; 2:40 – 4:00

- 70**  *Evidence-Based Recommendations for the Use of Less Invasive Surfactant Administration (LISA) Over the Intubate-Surfactant-Extubate Method (InSurE) for NICU Patients with Respiratory Distress Syndrome (RDS)*
Shauna Charles, Mackenzie Feight, Kelsey Hartman, Morgan Leader, Emma Pfau, Lisa Ross, Matt Schaefer, Patricia Miller^{††}, Deborah Schafer^{††}
- 71**  *Effects of Competent Preceptorship on New Graduate Nurses' Transition to Practice, Retention, and Confidence*
Emily Crago, Ella DeBruin, Brennen Puckett, Kailey Stoner, Jake Walker, Regan Zehr, Delancy Zeller^{††}
- 72**  *Evidence-Based Recommendations to Address Barriers to Breastfeeding by Providing Education and Support for Childbearing Black Women*
Jessica Alvarado, Avery Barley, Mayra Horcasitas, Emma Koch, Liv Scharfe, Kailey Watson, Kimberly Fenstermacher[†]
- 73**  *Evidence-Based Recommendations to Improve Nurses' Knowledge and Self-Efficacy in Identifying Adult Human Trafficking Victims in the Emergency Department*
Diona Adhikari, Abigail Cheong, Rachel Ford, Ehryn Groothoff, McKenzie Hambright, Hanna Mensch, Mary Kate Miller, Megan Gross[†]
- 74**  *Evidence-Based Recommendations to Improve Triage Accuracy in Emergency Department Nurses*
Si Barnes, Grace Fiero, Mackenzie Lorincz, Tim Lloyd, Rachel Moore, Eric Muthoka, Rebekkah Stanko[†]
- 75**  *Evidence-Based Recommendations to Decrease Firearm-Related Suicides by Veterans in the United States*
Sarah Cotner, Joshua Horst, Eli Keller, Nate Morse, Jack Ramsey, Chloe Richards, Brenda Elliott[†]



Engineering

Oakes Museum & Jordan Science Center; 3:00 – 4:00

- 76  *AFO Optimization and Biomechanical Analysis for Development of an Electromechanical Stance Control Orthosis*   17
Laurel Pettitt, David Alunni, Emily Javier, Elizabeth Hargrove, Kaitlyn Lutz, Justin Wood, Ryan Farris[†]
- 77  *An Assistive Technology for Pressing a Piano Sustain Pedal* 
Sawyer Haney, Kenneth Friedmann, Kierra Griffith, Sean Lau, Caitlin Renner, Philip Graybill[†], Dereck Plante[†]
- 78  *Better Pumps: Promoting Reliable Water Infrastructure for Everyone*   41
Gabe Henry, Connor McAtee, Aidan Pryor, Elizabeth Anthony, Ryan Friend, Jonathan Wyrick, Joseph Longenecker^{††}, David Vader[†]
- 79  *Biomechanical Consequences of Motion-Restricting Lower Extremity Orthoses* 
Callan Heise, Ryan Farris[†]
- 80  *Biomechanics of a Polycentric Magnetic Through-Knee Prosthesis*   16
Victoria Burgos, Daniel Jean, Caleb Bisbort, Paige Campbell, Nathan Jaloszynski, Cadee Wood, Philip Tan[†]
- 81  *Designing a Locally Manufacturable, All-Terrain Wheelchair for Zambian Students*   42
Samuel Cottrell, PJ Nitschke-Love, Blake Clemmer, Gabe Coakley, Cai Green, Timothy Van Dyke[†]
- 82  *Development of a Reliable, Low-Cost Wind Turbine Monitoring System*   13
Pj Cronauer, Turner Kekic, Sage Sobek, Justin Bucher, Noah Hege, Ethan Regula, Carlos Rivas, Tim Burdett[†]
- 83  *Engineering a Locally Manufacturable Standing Wheelchair for Nepal*   44
Trey Brackman, Maximus DeArville, Leah Gaigler, Caleb Kreider, Jacob Petrovich, Ryder Slayton, Joshua Holley, Caleb Mendoza, Bethany Sauder, Travis Settipane, Timothy Van Dyke[†]
- 84  *Evaluating the Zambian Seeder: A Look at the Sub-Assemblies' Performances*   43
Joshua Frazho, Max Kramer, Dylan Kratz, Shekinah Ellis, Dominic Pizzuti, Matthew Siegrist, Camilo Giraldo[†]
- 85  *Eye Movement Triggered Alarm for Late Stage ALS Patients*   45
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- 86  *Kenya Rainwater Collection and Distribution Design*   18
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- 94  *This is How We Brew It: Coffee Decaffeination*   11
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- 95  *Validation of GeneXpert MRSA Tests by PCR for Macha Research Trust in Zambia*  
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Oral Presentations (Late Afternoon)

Engineering III

Alexander Auditorium (Frey 110); 4:00 – 5:30

- | | | | |
|--|------|--|---|
| 41 | 4:00 |  <i>Better Pumps: Promoting Reliable Water Infrastructure for Everyone</i> |   |
| Ryan Friend, Jonathan Wyrick , Elizabeth Anthony, Gabe Henry, Connor McAtee, Aidan Pryor, Joseph Longenecker ^{††} , David Vader [†] | | | 78 |
| 42 | 4:20 |  <i>From Classroom to Sand: A Locally Manufacturable Wheelchair for Sikalongo, Zambia</i> |   |
| Blake Clemmer, Cai Green , Gabe Coakley, Samuel Cottrell, PJ Nitschke-Love, Timothy Van Dyke [†] | | | 81 |
| 43 | 4:40 |  <i>A Sustainable Seeder Design for Local Manufacturing and Maintenance in Zambia</i> |   |
| Shekinah Ellis, Dominic Pizzuti, Matthew Siegrist , Joshua Frazho, Max Kramer, Dylan Kratz, Camilo Giraldo [†] | | | 84 |
| 44 | 5:00 |  <i>Engineering a Locally Manufacturable Standing Wheelchair for Nepal</i> |   |
| Joshua Holley, Caleb Mendoza, Bethany Sauder, Travis Settupane , Trey Brackman, Maximus DeArville, Leah Gaigler, Caleb Kreider, Jacob Petrovich, Ryder Slayton, Timothy Van Dyke [†] | | | 83 |

Engineering IV




Frey 150; 4:00 – 5:30

- | | | | |
|---|------|--|---|
| 45 | 4:00 |  <i>Eye Movement Triggered Alarm for Late Stage ALS Patients</i> |   |
| David Brink, Sameh Faragallah, Xander Smith , Joshua Bingaman, Adriel Chan, Jacob Wong, Philip Graybill [†] | | | 85 |
| 46 | 4:20 |  <i>Design and Installation of a Solar Photovoltaic System for Rays of Peace in India</i> |   |
| Micah Clark, Adam Dressler , Autumn Derstine, Jady Martin, Cooper Willoughby, Dereck Plante [†] , Harold Underwood [†] | | | 90 |
| 47 | 4:40 |  <i>Detecting and Measuring Water Delivered by India Mark II Handpumps</i> |   |
| Owen Shea, Darin Landis , Stefan Leitzel, Randall Fish [†] | | | 91 |
| 48 | 5:00 |  <i>Masking Device Design for Improved Fluency Alternatives</i> |   |
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Computer and Information Science

Frey 145; 4:00 – 5:00

- 49 4:00  *Recipe for Success*
Noah Calisti, Ray Truex, Noah Brenneis, Jeff Sinsel
- 50 4:20  *Dorm Swap and Shop*
Michael Shoul, Joseph McGillen, Ben Clarke, Joshua Phillips
- 51 4:40  *Prayer Circle*
Aidan Hubley, Alexandru Muresan, Nason Allen, Justin Ayres, Andrew Roberti



Natural Sciences IV





Kline 120; 4:00 – 5:00

- 52 4:00  *Developing and Implementing a Resistance Training Library for Professionals and Clients*
Lindsay McFeaters, Anna Spencer, Melinda Smith[†], Kris Hansen-Kieffer[†]
- 53 4:20  *Adapting the Functional Mobility Screening Designed for Performance Athletes to Assess a Broader Population*
Jordan Phillips, Timothy Song, Melinda Smith[†], Kris Hansen-Kieffer[†]
- 54 4:40  *The Genetic Influences of Exercise on Serum Brain-Derived Neurotrophic Factor*
Bella Touzeau, Caleb Aldridge, Ben Van Deusen, Liliana Greer, Sophia Gray-Baublitz, H. Scott Kieffer[†]



Natural Sciences V





Jordan 159; 4:00 – 5:00

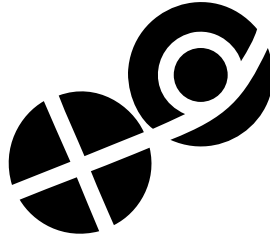
- 55 4:00  *Migwéch - Science, Language and Relationship in the Study of Forest County Potawatomi Ethnobotany*
Tyler Jahraus, David Foster[†]
- 56 4:20  *Evaluation of a Cell-Based Vaccine Against Pancreatic Cancer* 
Evangeline Soerens, John Harms[†], Lawrence Mylin[†]
- 57 4:40  *Seasonal and Habitat Differences in Necrophyllic Insect Communities*
Bryan Jones, David Foster[†]



Natural Sciences VI

Jordan 161; 4:00 – 5:00

- 58 4:00  *Turning CHIP Protein into a Hemeprotein*
Kwesi Kumi, Jesse Kleingardner[†]
- 59 4:20  *Creating a Predictive Model for Limestone Stream Health Assessment and Monitoring through Historical Macroinvertebrate and Water Chemistry Data*
Laurel Gaston, Jeff Erikson[†]
- 60 4:40  *Mutation of Twitch-2B to Create a Novel FRET In Vivo Biosensor for Transition Metal Ions* 
Sarah Smith, Jesse Kleingardner[†]



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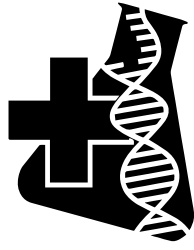
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- To increase the academic and professional abilities of participants, their vocational vision for lifelong servant-leadership, and their courage to act on convictions.

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The Steinbrecher Endowment for Research in the Health and Life Sciences was established at Messiah University in 2003 by Dr. Leroy and Mrs. Eunice Steinbrecher to support collaborative experimental research between students and faculty. Dr. Steinbrecher (Class of 1955) was a physician and longtime supporter of Messiah University. Eunice (Class of 1958) has served on the Board of Trustees at Messiah University continuously since 1987 and as chairperson of the board for 10 years (2000 – 2010).

The Steinbrecher Undergraduate Summer Research Program provides “heads-on, hands-on” research experiences essential to our School’s efforts to offer premier undergraduate health and science programs. The research must be experimental and collaborative in nature. Awarded on a competitive basis, the Steinbrecher fellowships provide a stipend supporting full-time research employment for between five and ten weeks of the summer.

Collaboratory Educators, Collaborators & Partners

We gratefully acknowledge the oversight and training provided by Messiah University faculty and external collaborators.

Project Partners

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Hope Walks
Intenational Nepal Fellowship
Macha Research Trust in Zambia
MM Ortho Solutions
New Beginnings Children’s Center
Physiofunction
Pretium Mobility
Rays of Peace, India
Rural Water Supply Network
Sikalongo Bible Institute
Tree 4 Hope – Guatemala
Unto/ Cru
WindAid, Peru

Project Managers

Tim Burdett
Ryan Farris
Randy Fish
Camilo Giraldo
Philip Graybill
Michelle Lockwood
Thomas Soerens
Philip Tan
Harold Underwood
David Vader
Tim Van Dyke

Project Consultants

Andy Erikson
J. Scott Heisey
John Meyer
Dereck Plante



Project Review Panelists

Tom Austin

Gebeyehu Ayele

Lexi Bane

Jordan Barner

Lyndsy Barry

David Bedillion

Tony Beers

Karl Bergmann

Ross Billings

Erin Brenneman

Mark Brill

Luke Brostek

Karen Burket

Steven Carpenter

Nathan Chan

Nathan Chaney

Nathan Cordell

Ethan Cornwell

Harrison Crosley

Alicia Decker

Avery deGruchy

Steven Deller

Ruth Douglas-Miller

Leah Eberly

Rob Ebner

Dan Elliott

Andy Erikson

Jeff Erikson

Matt Farrar

Luke Fetterman

Doug Flemmens

Rebekah Forshey

Jeremy Freimark

Dan Gallagher

Barak Gohn

Junior Guimaraes

Michael Guion

J. Scott Heisey

Robert Hentz

Zach Holsinger

Bryan Hoover

Tim Howell

Bruce Hulshizer

Amy Humphrey

Victoria Kimathi

Charlie Kimpel

Helen King

Taran King

Ray Knepper

Bob Kramer

Grant Kruppenbacher

Abaz Kryemadhi

Jason Kunec

Josh Kunkle

Raymond Landon

Vanessa Lee

Matt Lewis

Steve Lockwood

Chad Long

Joseph Longenecker

Dan Ma

Kevin Manieri

Jeff McIlhenny

Shayne McIntosh

Brant Meier

John Meyer

Al Mokris

Karine Moussa

Larry Mylin

Ray Norman

Stephen Osborne

Project Review Panelists, *continued*

| | | |
|--------------------|------------------|------------------|
| Jessica Paulus | Noah Rood | John Trimmer |
| Brandon Peterson | Jeremy Ross | Leif Uptegrove |
| Doug Phillipy | Carl Satterberg | Alex Waardenburg |
| Dereck Plante | Brian Seip | Don Waardenburg |
| Sandy Polak | Bob Sheker | Joe Wambach |
| T.J. Quintilian | Eric Shoemaker | Bryce Watkins |
| Mark Raup | Mark Simpkins | Ben Weaver |
| Luke Redcay | Zach Sizemore | Erik Weenink |
| Scott Reichenbach | Ella Sobek | Mike Weil |
| Steve Reisinger | Justin Stevenson | Joshua Wiedler |
| JJ Robinson | Doug Stumpp | Jamie Williams |
| Christian Rogerson | Gregory Talamo | Luke Witmer |

Faculty Research Mentors

We graciously acknowledge the oversight and training provided by faculty from the following academic departments.

Biological Sciences

Randy Cassell, M.S.

Jeff Erikson, M.S., MEPC

David Foster, Ph.D.

John Harms, Ph.D.

Erik Lindquist, Ph.D.

Lawrence Mylin, Ph.D.

Jennifer Ness-Myers, Ph.D.

Michael Shin, Ph.D.

Janet Barroga-Matanguihan, Ph.D.

Chemistry and Biochemistry

Seth Burkert, Ph.D.

Jesse Kleingardner, Ph.D.

Anne Reeve, Ph.D.

Roseann Sachs, Ph.D.

Richard Schaeffer, Ph.D.

Psychology, Criminal Justice and Sociology

Jennifer Thomson, Ph.D.

Health, Nutrition and Exercise Science

H. Scott Kieffer, Ed.D., FACSM, ACSM, ETT

Melinda Smith, Ed.D.

Kris Hansen-Kieffer, Ed.D.

Eric Rawson, Ph.D., FACSM

Computing, Mathematics and Physics

Trevor Bunch, Ph.D.

Niklas Hellgren, Ph.D.

Abaz Kryemadhi, Ph.D.

Amanda Lohss, Ph.D.

Nursing

Brenda Elliott, Ph.D., RN, CNE, ANEF

Kim Fenstermacher, Ph.D., RN

Megan Gross, Ph.D., MPH, RN, CNE

Rebekkah Stanko, DNP, RN

See Collaboratory Project Managers (p. 24) for faculty from the **Department of Engineering**.



Nursing Professionals

We gratefully acknowledge the oversight and training provided by the following nursing mentors.

| | <i>Presentation</i> |
|--|---------------------|
| Patricia Miller MSN, RNC-NIC | 70 |
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External Research Mentors

We graciously acknowledge the contributions of the following off-campus collaborating authors.

| | <i>Presentation</i> |
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| Douglas Flemmens | 14, 89 |
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| Ray Knepper | 10, 93 |
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Financial and Material Support

We gratefully acknowledge the following sources of funding and support.

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| Aligned Works | 47, 91 |
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| Gary and Sylvia Emberger Scholarship Fund | 29 |
| Glenview Alliance Church | 14, 89 |
| Len Puccio (Bostech, Inc.) | 77 |
| NASA PA Space Grant | 5 |
| Penn State Materials Research Facilities Network (MRFN) Faculty Fellowship program | 4 |
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| Tree 4 Hope | 11 |

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