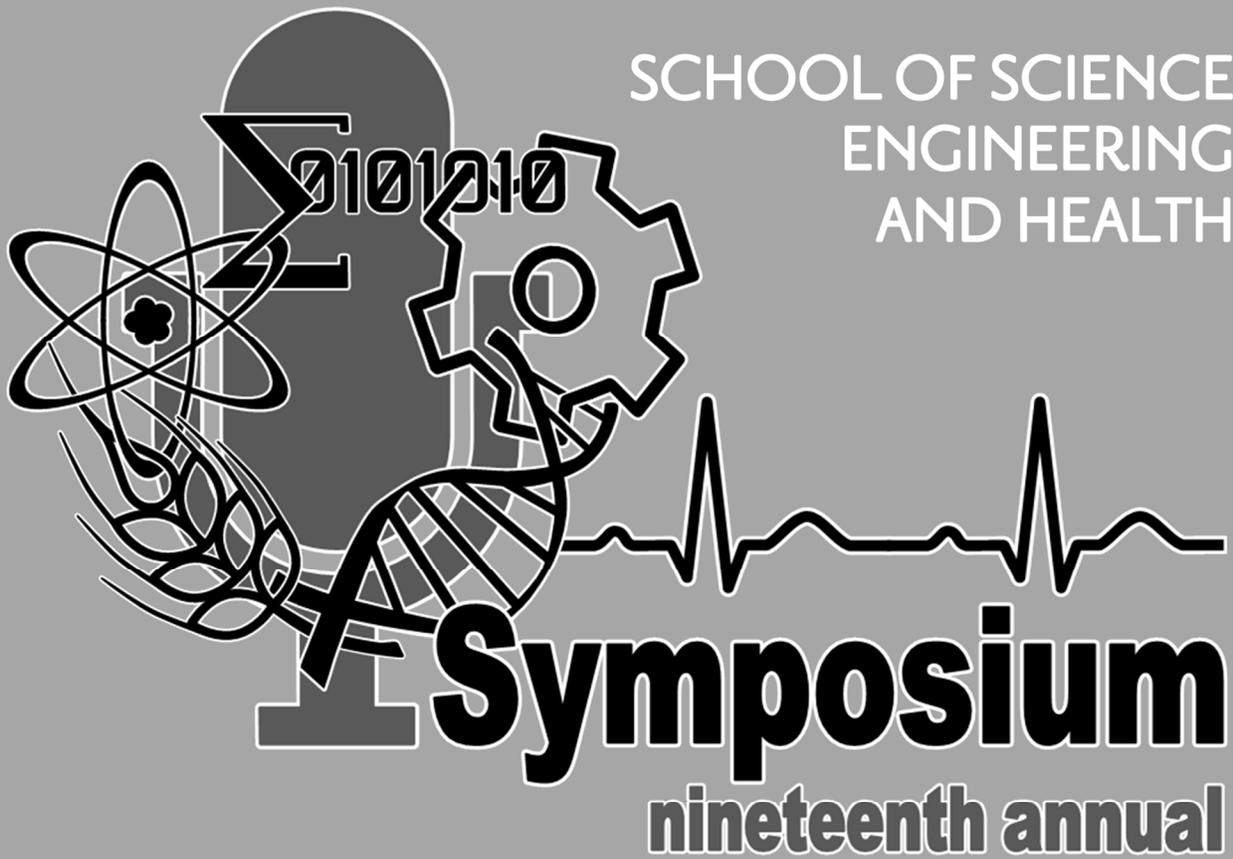


FRIDAY, APRIL 29, 2022

MESSIAH
UNIVERSITY



SCHOOL OF SCIENCE
ENGINEERING
AND HEALTH

Symposium

nineteenth annual

PROGRAM

A Word from the Dean

We in the School of Science, Engineering and Health welcome you to this 19th Annual Symposium, and we are pleased to invite you to join us physically on campus in the Frey, Kline, and Jordan buildings or to join sessions virtually.

Each year our students, faculty and staff present the fruits of their 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 Hare

Dean School of Science, Engineering and Health, Messiah University

Special Thanks

Thank you to Holly Myers, Administrative Assistant to the Dean of the School of Science, Engineering and Health, for coordinating room reservations, catering, and setup of the Symposium venues. We also thank Dr. Scott Weaver, D.P.S., Computing, Mathematics and Physics Department, for development and maintenance of the Symposium Project Registration and Management system (SymPRM) used to collect and organize the information contained in this booklet. Finally, we thank Dr. Timothy Van Dyke, Ph.D., Department of Engineering, for developing the web-based Symposium site (http://huggs.messiah.edu/seh_symposium/symposium.php) on which you can now find the information presented in this printed program, and more!

Larry Mylin, Ph.D., Symposium Coordinator

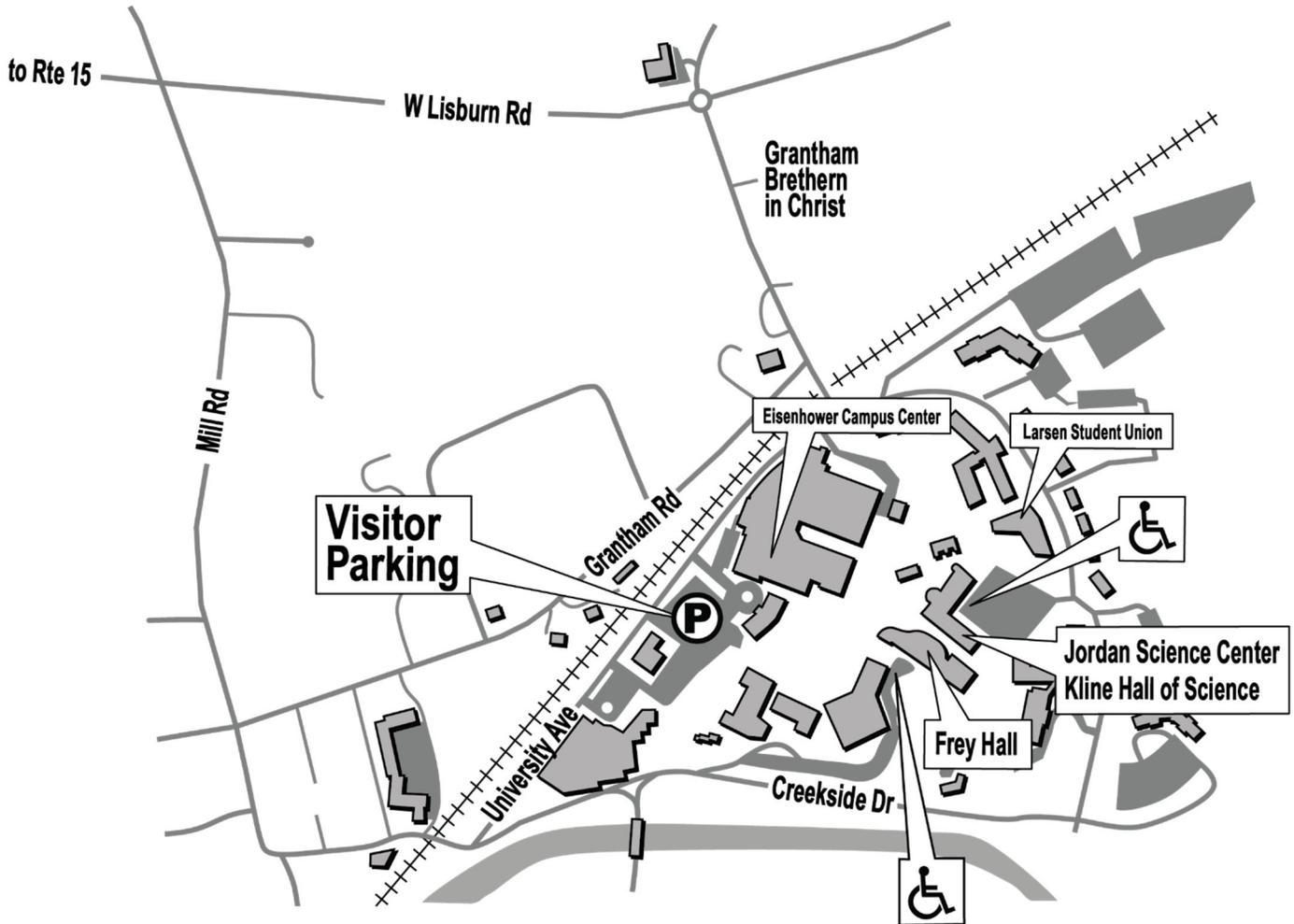
Tim Van Dyke, Ph.D., Engineering Coordinator

Welcome to the 19th 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 College Avenue, between Old Main and the Eisenhower Campus Center. Parking tags are not required during the Symposium. While designated handicapped parking spots are located throughout campus, spots closest to Symposium venues are available in the employee parking lot (WW) which is located behind the Jordan Science Center.

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 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 this Program. The name of each **participating author** is indicated in **bold font**. An **Index** at the end of the booklet (page 33) lists the names of all authors alphabetically with the number(s) of each presentation on which each author is included.

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

Abstracts: Abstracts for each oral and poster presentation in the Symposium are provided in the accompanying web-based program found at: http://huggs.messiah.edu/seh_symposium/symposium.php

Acknowledgments: All faculty mentors, external mentors and collaborators, and nursing professionals are recognized. Sources of financial and material support are also listed (page 32) with corresponding presentation numbers.

Authorship Legend:

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

Discipline Categories:

-  Cellular & Molecular Biology
-  Chemistry & Biochemistry
-  Computer & Information Science
-  Engineering
-  Nutrition & Dietetics (or Ex. Sci.)
-  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
-  Extended presentation (~45 min)

Alexander Auditorium (Frey 110)

Frey 150

Frey 349



Engineering I

Physics

Mathematics, Cellular & Molecular Biology

8:55	Welcome and instructions by Session Chairs		
9:00	1 Barnes, Hauger	15 Thurber	28 Σ Andrews
9:20	2 Welch, Pavlovich	16 Neal	29 Σ Andrews, Fisher, Wenger
9:40	3 Bunch, Rashford	17 Branson	30 Σ Caras
10:00	4 Card, Maxson	18 Pavill	31 Σ Fisher
10:20	5 Tolley, Bashore, Eells	19 Whitehead-Zimmers	32 Lapp
10:40	6 Higgs, Donley	20 Daugherty	33 Σ Kelchner
11:00	7 Rood, Kolb, Pilawski, Shields-Seelig		34 Σ Hartman, McAllister, & McVay
11:20			35 Σ McVay
11:40			36 Σ Whipple



Engineering Poster Session

11:20-12:00 Frey 070



Engineering II

Engineering III

Computer & Information Science

1:00	8 Bruns, Andrews, Class	21 Wilcox, Andrews	37 McCracken, Johnson
1:20	9 Kelchner, Bryner, Urich	22 Long, Finkbeiner	38 Chappell
1:40	10 Southall, Cornwell, Lo, Meekins	23 McCarthy, Reber	39 Nicholas
2:00	11 Mokris & Paulus	24 Stone, Gates	40 Zarate
2:20	12 Sampson, Haseltine, & Monday	25 Heckman, Dean, Tiday	
2:40	13 Lee, Hamann	26 Fetterman, Barner	
3:00	14 Barton, Cornwell	27 Thomas, Hockenberry, Light	



Engineering Poster Session

3:20-4:20 Frey 070

Oral Presentations

Kline 120

Jordan 159

Jordan 161

Kline 113



Cellular & Molecular,
Organismal Biology I

Cellular & Molecular,
Organismal Biology II

Nutrition &
Dietetics

Chemistry &
Biochemistry

1:00 40  Guevin

49  Boyce

56  DeStefano, Nolt,
Garman

62  Smith

1:20 41  Johnston

50  Herr

57  Meisel, Myers,
Kuykendall

63  Colon

1:40 42  Harding

51  Johnston

58  Lepley, Brown, Carter

64  Florio

2:00 43  Wynne

52  Velazco

59  Stambaugh, Galbraith,
Howland, Connolly

65  Artz

2:20 43  McCoy

53  Zondory

60  Taylor, Marcroft, &
Mayo

66  McClymont



Poster Session 2:40-4:00 Hollinger Atrium & Lounge



Biochemistry II

Cellular & Molecular
Biology, Chemistry

Biochemistry III

4:00 46  Clements

54  Bath

61  Smith, White,
Kabonick

4:20 47  Mateer

55  Olson

4:40 48  Schreckengast





Poster Presentations



Engineering

Frey 070 Project Space; 11:20 – 12:00, 3:20 – 4:20

71  Bartels, Hilton

79  Gillen, Goertzen

87  Miller, Dupler

72  Bingaman, Clancy

80  Ginck, Stefanchik

88  Moyer, Mundis

73  Campbell, Santelli, Wright

81  Groff, Caldwell

89  Huang, Seubert

74  Deutcheu Tchouako

82  Horst, Thrush

90  Shirk, Geyer, Sison

75  Fair, Wood

83  Hunsberger, Brandt

91  Sinsel, Glavin

76  Fouse, Rasinske, Snodgrass

84  Mah, Zehr

92  Witt, Fertig

77  Galyen, Bruner

85  Merlo, Siegrist, Wildasin

78  Gehenio, Matanguihan,
Rosengrant, Wong

86  Miller, Sonon



Evidence-Based Nursing Care & Exercise Science

Hollinger Lounge; 2:40 – 4:00

93  Daudt, Doran

97  Davenport, Showalter, Bailey,
Gambone, Longshaw

101  Woland, Mowery, Snyder,
Furjanic

94  Augustine, Heiman, MacKay,
Rakerd, Reed

98  Hill, Good, Pstrak, McCrary

95  Bassett, Raschke, Oberholtzer,
Ehrhart, Eich

99  Hoffmann, Dunkerton,
Huebner, Seeley

96  Coburn, Hayden, Hartman,
George

100  Wilkin, Hoffman, Wilkinson,
Allbee, Gehr



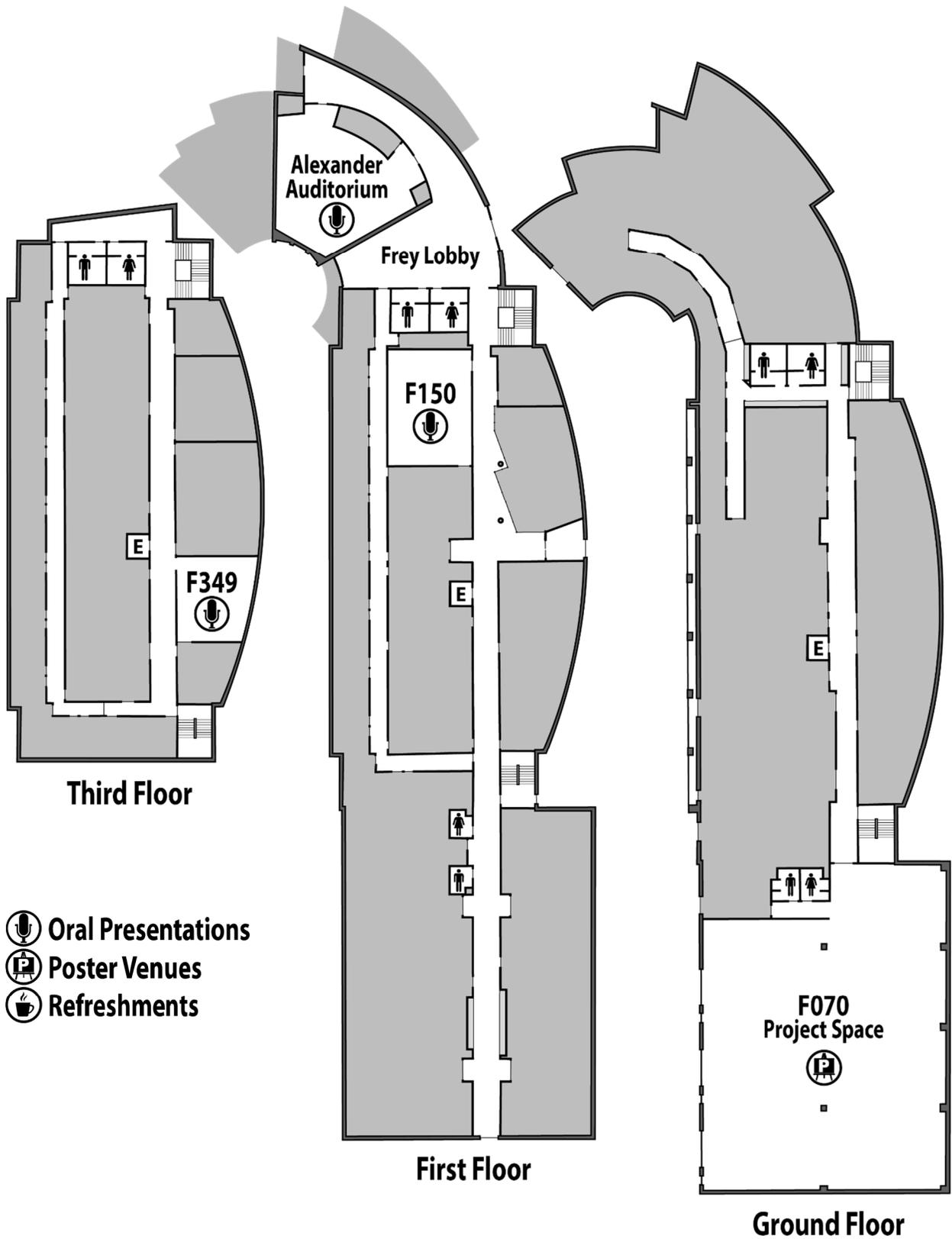
Natural Sciences

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

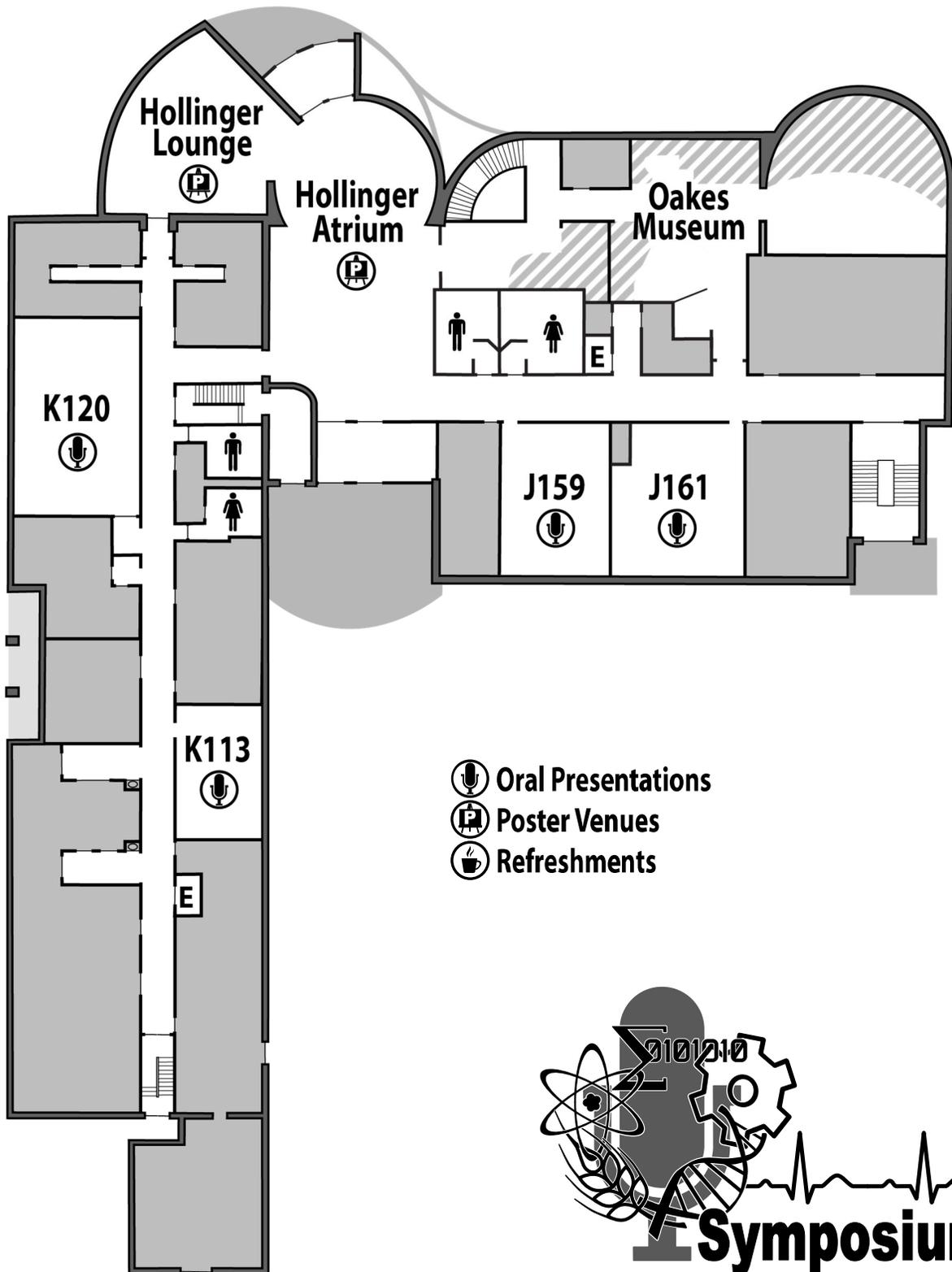
- | | | | | | |
|----|---|-------------------------|----|---|--|
| 41 |  | Guevin | 57 |  | Meisel, Myers, Kuykendall |
| 42 |  | Johnston | 58 |  | Lepley, Brown, Carter |
| 43 |  | Harding | 59 |  | Stambaugh, Galbraith,
Howland, Connolly |
| 44 |  | Wynne | 60 |  | Taylor, Marcroft, Mayo |
| 45 |  | McCoy | 65 |  | Artz |
| 49 |  | Boyce | 66 |  | McClymont |
| 50 |  | Herr | 67 |  | Cordell |
| 51 |  | Johnston | 68 |  | Kennedy |
| 52 |  | Velazco | 69 |  | Stevenson |
| 53 |  | Zondory | 70 |  | Swanson |
| 56 |  | DeStefano, Nolt, Garman | | | |



Frey Hall



Jordan Science Center - Kline Hall of Science



-  Oral Presentations
-  Poster Venues
-  Refreshments



Oral Presentations (Morning)

Engineering I

Alexander Auditorium (Frey 110); 9:00 – 11:20

- | | | | |
|---|-------|--|---|
| 1 | 9:00 |  <i>Designing a Locally Manufacturable Wheelchair for Nepal</i>
Ethan Barnes, Levi Hauger , Pauline Deutcheu Tchouako, Joshua Holley, Jacob Petrovich, Timothy Van Dyke† |  
74 |
| 2 | 9:20 |  <i>Redesign and Fabrication of an Adjustable Prone Trolley for People Suffering from Spinal Cords Injuries in Nepal</i>
Connor Welch, Jared Pavlovich , Katie Anthony, Blake Clemmer, Ryan Friend, Abby Miller, Lukas Sonon, Timothy Van Dyke† |  
86 |
| 3 | 9:40 |  <i>A Sustainable Mobility Solution for Persons Living with Disability in Burkina Faso</i>
Katie Bunch, Rachel Rashford , Timothy Glavin, Joey Sinsel, John Meyert†, David Vader† |  
91 |
| 4 | 10:00 |  <i>Better Pumps: Promoting Reliable Water Infrastructure for Everyone</i>
Josh Card, Joshua Maxson , Benjamin Brandt, Andrea Hunsberger, Reese Johnston, Jonathan Wyrick, Tony Beers††, Matthew Schwiebert††, David Vader† |  
83 |
| 5 | 10:20 |  <i>Cracking the Code to Locally Sourced, Low-Cost and High-Quality Egg Incubators for Zambian Churches</i>
Claudia Tolley, Aaron Bashore, Matt Eells , Shekinah Ellis, Brandon Koehnke, Lane Magness, Joshua Mah, Cooper Willoughby, Cadee Wood, Josiah Zehr, Dan Elliott††, Philip Tan† |  
84 |
| 6 | 10:40 |  <i>Wear Testing of a Mechanized Percussion Well Drilling System for Water Access in West Africa</i>
Matthew Higgs, Robert Donley , Matthew Merlo, Matthew Siegrist, Jacob Wildasin, J Scott Heisey† |  
85 |
| 7 | 11:00 |  <i>Energy Independence With Solar for Tree 4 Hope</i>
Noah Rood, Jonas Kolb, Christian Pilawski, Garrison Shields-Seelig , Josh Ginck, Riley Harro, Michael Stefanchik, Harold Underwood† |  
80 |



Physics

Frey 150; 9:00 – 11:00

- 15 9:00  *Development of a Detector System for Dark Photon Dark Matter*
Ryan Thurber, Abaz Kryemadhi†, Niklas Hellgrent†
- 16 9:20  *Dark Photon Dark Matter Detector II*
Samantha Neal, Abaz Kryemadhi†, Niklas Hellgrent†
- 17 9:40  *Calorimeter Reconstruction Tools for AI-Driven Optimization on the Electron Ion Collider*
Nathan Branson, Abaz Kryemadhi†
- 18 10:00  *Damping Effects on Sound Waves*
Hanna Pavill, Niklas Hellgrent†
- 19 10:20  *Protecting Coastal Communities: Impact of Partial Wave Data on Oceanographic Modeling*
Eli Whitehead-Zimmers, Niklas Hellgrent†
- 20 10:40  *Laser tomography*
Dalton Daugherty, Abaz Kryemadhi†



Mathematics, Cellular & Molecular Biology

Frey 349; 9:00 – Noon

- 28 9:00 Σ *Development and Applications of Brownian Motion*
Noah Andrews
- 29 9:20 Σ *COMAP Modeling Competition: Automated Trading Strategies*
Noah Andrews, Matthew Fisher, Jaron Wenger
- 30 9:40 Σ *An Introduction to Sabermetrics*
Kasey Caras
- 31 10:00 Σ *Linear Programming and its Algorithms*
Matthew Fisher
- 32 10:20  *Developing an Immunocompetent Murine Model for the Investigation of Fibrosis in Metastases of Pancreatic Ductal Adenocarcinoma*
Sean Lapp, John Harmst†

- 33 10:40 Σ *An Exploration of Nondimensional Parameters and Applications in Fluid Dynamics*
Sarah Kelchner
- 34 11:00 Σ *Nonparametric Curve Fitting: Techniques and Applications*
Sarah Hartman, Ryan McAllister, Griffin McVay, Samuel Wilcock†
- 35 11:20 Σ *Probability Distributions and Settlers of Catan*
Griffin McVay
- 36 11:40 Σ *An Alternative Approach to Center of Mass Problems in Introductory Calculus and its Implications for Teaching*
Jacob Whipple



Oral Presentations (Early Afternoon)



Engineering II

Alexander Auditorium (Frey 110); 1:00 – 3:20

8	1:00	 <i>Rapid Orthotics for CURE Kenya 3D-Printed Transtibial Socket Design and Safety Testing</i> Rachel Bruns, Joey Andrews, Ryan Class, Rachel Huang, Lauren Seubert, Jamie Williams†	  89
9	1:20	 <i>Prosthetic Knee for CURE Kenya: Mechanical Design and Manufacturing of a Prosthesis for Disarticulation Amputees</i> Sarah Kelchner, Isaiah Bryner, Carter Urich, Nathan Jaloszynski, Josiah Moyer, Josh Mundis, Jamie Williams†	  88
10	1:40	 <i>Force Characterization and Manufacturing of a Dynamic Unilateral Clubfoot Brace</i> Leigha Southall, Jacob Cornwell, Michelle Lo, Clint Meekins, Brittney Fouse, Sam Rasinske, Stevie Snodgrass, Tim Howell†	  76
11	2:00	 <i>A Low Cost, Portable Fluorescence correlation Spectrometer for Disease Diagnosis</i> Al Mokris, Jessica Paulus, Michael Geyer, Brittany Shirk, Jon Sison, Randall Fish†	  90
12	2:20	 <i>Muscle Activated 3D Printed Prosthetic Arm</i> Meghan Sampson, Lindsay Haseltine, Jaymie Monday, Paige Campbell, Antonio Santelli, Caleb Wright, Tim Howell†	  73
13	2:40	 <i>A Modular Functional Electrical Stimulation (FES) System for Gait Assistance in Pediatric Cerebral Palsy</i> Timothy Lee, Nick Hamann, Wyatt Bingaman, Andrew Clancy, Callan Heise, Ryan Farris†	  72
14	3:00	 <i>A Low-Cost Microprocessor-Controlled Stance-Control Knee Orthosis for Pediatric Mobility Impairments</i> Jacob Barton, Ethan Cornwell, Levi Fertig, Jordan Witt, Ryan Farris†	  92



Engineering III

Frey 150; 1:00 – 3:20

- | | | | |
|----|------|---|--|
| 21 | 1:00 |  <i>EMMS: Increasing Hope and Transforming Lives Through Improved Access to Electrical Power</i>
Seth Wilcox, Bennett Andrews , Adam Dressler, Zach Gillen, Samuel Goertzen, Kyle Green, Caitlin Ross, Tom Austin† | 

79 |
| 22 | 1:20 |  <i>Fluency Assistance Device (FAD): Masker Upgrades</i>
Chad Long, Jake Finkbeiner , Timothy Fair, Jon Sweeton, Elijah Wood, Harold Underwood† | 

75 |
| 23 | 1:40 |  <i>Improving Access to Clean Water Through Autonomous Monitoring of Hand Pump Operation</i>
Josiah McCarthy, Lydia Reber , Matt Caldwell, Jared Groff, Randall Fish† | 

81 |
| 24 | 2:00 |  <i>Village Water Ozonation System</i>
Sam Stone, Benjamin Gates , Olivia Allbee, Nate Binko, Caleb Bruner, Ruth Galyen, Seth Kline, Ray Knepper††, Michelle Lockwood† | 

77 |
| 25 | 2:20 |  <i>Sustainable Agriculture</i>
Madalyn Heckman, Jacob Dean, Gabriel Tiday , Cassie Gehenio, Miggy Matanguihan, Josh Rosengrant, Jacob Wong, Aleesa Wu, Michelle Lockwood† | 

78 |
| 26 | 2:40 |  <i>Kenbrook Bridge Project</i>
Luke Fetterman, Jordan Barner , Logan Horst, Noah Thrush, Brian Swartz† | 

82 |
| 27 | 3:00 |  <i>Stormwater Management for Greenwood Hills Bible Camp</i>
Daniel Thomas, Warner Hockenberry, Caleb Light , Abby Bartels, Caleb Hilton, Thomas Soeren† | 

71 |



Computer and Information Science

Frey 349; 1:00 – 2:20

- 37 1:00  *emotive*
Josiah McCracken, Micah Johnson, Kyle Luce, Annika Kowalski,
Wesley Peng Hym Cheah
- 38 1:20  *The Loop*
Alec Chappell, Caden Robertson, Robbie Dorsey, Joseph Tonnie,
Timothy Diana
- 39 1:40  *Intelligent Water Dashboard*
Hallie Nicholas, Adam Hungerford, Isaac Parada
- 40 2:00  *Multicultural Council App*
Felix Zarate, Roman Searle, Joe Vera, Emily Lopez



Cellular & Molecular Biology, Organismal Biology I

Kline 120; 1:00 – 2:40

- 41 1:00  *Development and Testing of a Tumor Cell-Based Vaccine for
Pancreatic Cancer* 
Daniel Guevin, Sarah Bath, John Harmst[†], Lawrence Mylin[†]
- 42 1:20  *Optimization of a novel qRT-PCR assay for relative quantification of
CCK2R splice variants in pancreatic cancer* 
Natalie Johnston, John Harmst[†]
- 43 1:40  *Developing a Protocol for Accurately Quantifying Low Levels of CCK2R
Expression in Downregulated Pancreatic Cancer Cells* 
Joshua Harding, John Harmst[†]
- 44 2:00  *Aquaponic Growth of Ginseng and Potatoes* 
Jessie Wynne, David Fostert[†]
- 45 2:20  *Dietary Analysis of the Long-tailed Salamander, *Eurycea longicauda** 
Joshua McCoy, Randy Cassell[†]



Cellular & Molecular Biology, Organismal Biology II

Jordan 159; 1:00 – 2:40

- | | | | | |
|----|------|---|--|---|
| 49 | 1:00 |  | <i>Hybridization and Evaluation of Spring Varieties of flax (<i>Linum usitatissimum</i>) in South Central PA</i>
Katelyn Boyce, Glafera Janet Matanguihant |  |
| 50 | 1:20 |  | <i>Breaking Down Barriers: Understanding the Impacts of Small Dam Construction on Biodiversity of Aquatic Macroinvertebrates</i>
Kayla Herr, Jeff Erikson |  |
| 51 | 1:40 |  | <i>Establishing developmental hypoxia models in <i>Danio rerio</i> and cultured oligodendrocytes</i>
Madeline Johnston, Jennifer Ness-Myers |  |
| 52 | 2:00 |  | <i>Generation of Neutralizing Monoclonal Antibodies Against Bacteriophage T4</i>
Lily Velazco, Hunter Zondory, Lawrence Mylin |  |
| 53 | 2:20 |  | <i>Generating Neutralizing Monoclonal Antibodies Against Bacteriophage T4: Designing a Screening Assay</i>
Hunter Zondory, Lily Velazco, Lawrence Mylin |  |



Nutrition & Dietetics

Jordan 161; 1:00 – 2:40

- | | | | | |
|----|------|---|---|---|
| 56 | 1:00 |  | <i>Perceived Stress does not have an Impact on Dietary Behavior in Messiah University Students enrolled in a Wellness Course</i>
Kaitlyn DeStefano, Heidi Nolt, Sabrina Garman, Amy Porto |  |
| 57 | 1:20 |  | <i>Preprandial Caffeine Administration has No Effect on Blood Glucose response in Messiah University students</i>
Alyssa Meisel, Brittany Myers, Tyler Kuykendall, Amy Porto |  |
| 58 | 1:40 |  | <i>Short-term ashwagandha supplementation did not mitigate acute stress and anxiety response in college students</i>
Jordan Lepley, McKenna Brown, Cameron Carter, Amy Porto |  |
| 59 | 2:00 |  | <i>Habitual Breakfast Skipping contributes to Lower GPA but Not Caffeine Intake in Messiah University Students</i>
Sophie Stambaugh, Joy Galbraith, Kirsten Howland, Cera Connolly, Amy Porto |  |

- 60 2:20  *Eating attitudes assessment of children enrolled in The Salvation Army's After School Program* 
Sarah Taylor, Rachel Marcroft, Heather Mayo, Amy Porto†

Chemistry & Biochemistry I

Kline 113; 1:00 – 2:40

- 62 1:00  *In vivo synthesis of metal-substituted horse cytochrome c in E. coli via metal-supplemented autoinducing media* 
Courtney Smith, Jesse Kleingardner†
- 63 1:20  *Incorporation of a red fluorescent protein, mScarlet, into an HIV-binding fusion protein* 
Abigail Colon, Jesse Kleingardner†
- 64 1:40  *Expression trials of an engineered heme protein with novel heme c stacking*
Michael Florio, Jesse Kleingardner†
- 65 2:00  *Ionic liquids as both solvent and reagent in electrophilic addition reactions* 
Hannah Artz, Roseann Sachs†
- 66 2:20  *Methylimidazolium Bromide as a Recyclable Ionic liquid for Electrophilic Addition Reactions* 
Caleb McClymont, Roseann Sachs†

Oral Presentations (Late Afternoon)

Biochemistry II

Kline 120; 4:00 – 5:00

- 46 4:00  *Generating expression vectors for an in vitro heme attachment assay* 
Spencer Clements, Jesse Kleingardner†
- 47 4:20  *Evaluating the Fluorescence of Twitch-2B Calcium Binding Proteins In Vivo*
Sarah Mateer, Jesse Kleingardner†
- 48 4:40  *Metal Cofactor Substitutions in Heme c*
Sean Schreckengast, Jesse Kleingardner†

Cellular & Molecular Biology, Chemistry

Jordan 159; 4:00 – 4:40

- 54 4:00  *Analysis of Pancreatic Tumor Growth in Response to Targeted Immunotherapy*
Sarah Bath, Daniel Guevin, John Harmst†, Lawrence Mylin†
- 55 4:20  *The Reduction of Oxygen Using Screen Printed Electrodes with a Nafion® Barrier*
Erik Olson, Richard Schaeffer†

Biochemistry III

Jordan 161; 4:00 – 5:00

- 61 4:00  *Designing anti-diabetic therapies inspired by the medicines of nature* 
Noah Smith, Sydney White, Seth Kabonick, Anne Reeve†



Poster Presentations



Engineering

Frey 070 Project Space; 11:20 – 12:00, 3:20 – 4:20

- | | | | |
|----|---|---|---|
| 71 |  | <i>Stormwater Management for Greenwood Hills Bible Camp</i>
Abby Bartels, Caleb Hilton , Warner Hockenberry, Caleb Light, Daniel Thomas, Thomas Soerens [†] |  
27 |
| 72 |  | <i>A Modular Functional Electrical Stimulation (FES) System for Gait Assistance in Pediatric Cerebral Palsy</i>
Wyatt Bingaman, Andrew Clancy , Nick Hamann, Callan Heise, Timothy Lee, Ryan Farris [†] |  
13 |
| 73 |  | <i>Muscle Activated 3D Printed Prosthetic Arm</i>
Paige Campbell, Antonio Santelli, Caleb Wright , Lindsay Haseltine, Jaymie Monday, Meghan Sampson, Tim Howell [†] |  
12 |
| 74 |  | <i>Designing a Locally Manufacturable Wheelchair for Nepal</i>
Pauline Deutcheu Tchouako , Ethan Barnes, Levi Hauger, Joshua Holley, Jacob Petrovich, Timothy Van Dyke [†] |  
1 |
| 75 |  | <i>Fluency Assistance Device (FAD): Masker Upgrades</i>
Timothy Fair, Elijah Wood , Jake Finkbeiner, Chad Long, Jon Sweeton, Harold Underwood [†] |  
22 |
| 76 |  | <i>Force Characterization and Manufacturing of a Dynamic Unilateral Clubfoot Brace</i>
Brittney Fouse, Sam Rasinske, Stevie Snodgrass , Jacob Cornwell, Michelle Lo, Clint Meekins, Leigha Southall, Tim Howell [†] |  
10 |
| 77 |  | <i>Village Water Ozonation System</i>
Ruth Galyen, Caleb Bruner , Olivia Allbee, Nate Binko, Benjamin Gates, Seth Kline, Sam Stone, Ray Knepper ^{††} , Michelle Lockwood [†] |  
24 |
| 78 |  | <i>Sustainable Agriculture</i>
Cassie Gehenio, Miggy Matanguihan, Josh Rosengrant, Jacob Wong , Jacob Dean, Madalyn Heckman, Gabriel Tiday, Aleesa Wu, Michelle Lockwood [†] |  
25 |
| 79 |  | <i>EMMS: Increasing Hope and Transforming Lives Through Improved Access to Electrical Power</i>
Zach Gillen, Samuel Goertzen , Bennett Andrews, Adam Dressler, Kyle Green, Caitlin Ross, Seth Wilcox, Tom Austin [†] |  
21 |

- 80  *Designing a Solar PV System for Tree 4 Hope*   7
Josh Ginck, Michael Stefanchik, Riley Harro, Jonas Kolb, Christian Pilawski, Noah Rood, Garrison Shields-Seelig, Harold Underwood[†]
- 81  *Improving Access to Clean Water Through Autonomous Monitoring of Hand Pump Operation*   23
Jared Groff, Matt Caldwell, Josiah McCarthy, Lydia Reber, Randall Fish[†]
- 82  *Kenbrook Bridge Project*   26
Logan Horst, Noah Thrush, Jordan Barner, Luke Fetterman, Brian Swartz[†]
- 83  *Better Pumps: Promoting Reliable Water Infrastructure for Everyone*   4
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- 93  *Using the m-Trigger to Determine the Relationship Between Gluteus Medius Maximum Voluntary Isometric Contraction (MVIC) and Performance on the Y-Balance Test in Collegiate Track and Field Runners*
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- 94  *The Effect of Bereavement Interventions on Depression, Anxiety, and Grief After Perinatal Loss*
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- 95  *Evidence Based Non-Pharmacological Recommendations to Decrease Delirium in the Hospitalized Pediatric Population*
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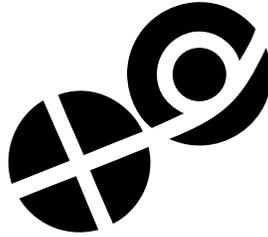


Natural Sciences

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

- 41  *Development and Testing of a Tumor Cell-Based Vaccine for Pancreatic Cancer* 
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- 42  *Optimization of a novel qRT-PCR assay for relative quantification of CCK2R splice variants in pancreatic cancer* 
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- 43  *Developing a Protocol for Accurately Quantifying Low Levels of CCK2R Expression in Downregulated Pancreatic Cancer Cells* 
Joshua Harding, John Harms[†]
- 44  *Aquaponic Growth of Ginseng and Potatoes* 
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- 45  *Dietary Analysis of the Long-tailed Salamander, *Eurycea longicauda** 
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- 49  *Hybridization and Evaluation of Spring Varieties of flax (*Linum usitatissimum*) in South Central PA* 
Katelyn Boyce, Glafera Janet Matanguihan[†]
- 50  *Breaking Down Barriers: Understanding the Impacts of Small Dam Construction on Biodiversity of Aquatic Macroinvertebrates* 
Kayla Herr, Jeff Erikson[†]
- 51  *Establishing developmental hypoxia models in *Danio rerio* and cultured oligodendrocytes* 
Madeline Johnston, Jennifer Ness-Myers[†]
- 52  *Generation of Neutralizing Monoclonal Antibodies Against Bacteriophage T4* 
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- 56  *Perceived Stress does not have an Impact on Dietary Behavior in Messiah University Students enrolled in a Wellness Course* 
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- 66  *Methylimidazolium Bromide as a Recyclable Ionic liquid for Electrophilic Addition Reactions* 
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- 67  *Analysis of Contamination in Fetal Bovine Serum (FBS) for Pancreatic Cancer Research*
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- 68  *Expression of LCK and LYN in Activated Microglia*
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- 69  *Machine Learning as Supplementation to Molecular Docking in the Discovery of Novel PTP1B Inhibitors*
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- 70  *Modeling Interstellar Medium: a Computational Approach to Predicting Polycyclic Aromatic Hydrocarbons*
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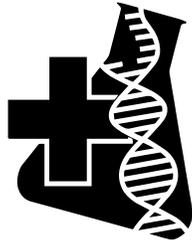
The **Collaboratory** is a center for applied research and project-based learning in the School of Science, Engineering and Health at Messiah College. We add value to classroom learning by enabling participants to apply academic knowledge and live out their Christian faith through imaginative, hands-on problem solving that meets needs brought to us by Christian mission, relief and development organizations and businesses. The two-fold mission of the Collaboratory is:

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The Steinbrecher Endowment for Research in the Health and Life Sciences was established at Messiah College (now 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 College. Eunice (Class of 1958) has served on the Board of Trustees at Messiah College continuously since 1987 and as chairperson of the board for 10 years (2000 – 2010).

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Collaboratory Educators, Collaborators & Partners

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

Project Partners

Ability Prosthetics and Orthotics- Kenya
AlignedWorks
Brethren In Christ Church- Zambia
Capital Region Water
Center of Hope- Burkina Faso
City of Harrisburg Sustainability Office
CURE International- Ethiopia
CURE International- Kenya
Forward Edge International- Nicaragua
Friends In Action (FIA) International- Nicaragua
Full Gospel Assemblies- Mexico
The Halo Trust- UK
Harrisburg School District
IEEE Smart Village
International Nepal Fellowship- Nepal
Kenbrook Bible Camp
Living Love Ministries- Kenya
Macha Research Trust- Zambia
Mennonite Central Committee- Guatemala
Open Door Development- Burkina Faso
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Sheltering Wings- Hawaii
SIM: Open Door Development- Burkina Faso
Theological College of Zimbabwe
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See Collaboratory Project Managers (p. 27) for faculty from the **Department of Engineering**.



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