



***THE 18<sup>TH</sup> ANNUAL***

**CELEBRATION OF  
UNDERGRADUATE  
RESEARCH AND  
CREATIVE ACTIVITY**

***APRIL 12, 2019***

***2:30–5 PM***

***DEVOS FIELDHOUSE***



**Hope** COLLEGE

[hope.edu/celebration](http://hope.edu/celebration)

# Celebration of Undergraduate Research and Creative Activity

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## Welcome

April 12, 2019

Dear Friends,

We are pleased to welcome students, guests, and community members to the 18<sup>th</sup> annual Celebration of Undergraduate Research and Creative Activity at Hope College. This event highlights scholarly accomplishments by talented Hope students working collaboratively with exceptional faculty mentors.

Each project at this event describes original and creative scholarship arising from research that Hope students and faculty have pursued together. Beyond the development of new knowledge, these projects are among the most transformative learning experiences in a student's academic career. The interaction with caring and dedicated faculty mentors results in expanded awareness and opportunities for student post-graduate plans and career aspirations.

This year's Celebration includes 202 presentations by 327 students from 27 different departments and programs. Research occurs both during the academic year and summer, spans the four academic divisions, and includes independent study and course-based research. Hope students regularly receive national recognition for their research accomplishments with NSF Graduate Research Fellowships, Fulbright Scholarships, Goldwater Scholarships, and professional society awards.

Hope College is nationally recognized for the extent and quality of its undergraduate research program. Students regularly present their research at regional and national conferences and publish their research as co-authors with their faculty mentors. During calendar year 2018, Hope students made 153 presentations at off-campus conferences and submitted or published 28 journal articles. Hope College currently receives over \$12 million in active external grant funding that supports 69 research and educational projects.

Thank you for your participation in and support of this Celebration. To learn more about research experiences at Hope College, visit the website: [hope.edu/research](http://hope.edu/research).

Sincerely,



William F. Polik

Associate Dean for Research and Scholarship

## Acknowledgements

**Cover artwork by Saem Cho, '19**, Photograph. (Created with acrylic paint on a light board.)

William F. Polik and Laura R. McMullen, Celebration Co-directors; Deborah DuMez and Leo Herzog, Computing and Information Technology; Michelle VanDenend & staff, Creative Dining Services; Heather Roden & staff, Events and Conferences Office; Daphne Fairbanks & Sonja Glover, Media Center and TechLab; Laura Clarke, Michael Culver, & staff, Physical Plant; Kristi Rosendahl, Print and Mail Services; Rebecca Robrahn, Paul Willard, & staff, Public Affairs and Marketing

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## Listing of Projects by Department or Program

Numbers reference the project number on the floor of the event, see pg 17 for a floor map.

### Art and Art History

Mentor: Dr. Anne Heath

- |            |            |  |
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| <b>111</b> | Holle Wade | For Duly Keeping and Preserving Relics |
|------------|------------|--|

### Biochemistry & Molecular Biology

Mentors: Drs. Maria Burnatowska-Hledin, Leah Chase, and Kristin Dittenhafer-Reed

- |           |  |  |
|-----------|--|--|
| <b>43</b> | Joel Karsten   | Use of the CRISPR/Cas9 Gene Knockout System to Study the Effects of VACM-1/Cul5 on Cellular Proliferation  |
| <b>44</b> | Skylar Sundquist   | The Regulation of Cellular Proliferation by VACM-1/CUL5 is Dependent on its Posttranslational Modifications by NEDD8                                 |
| <b>45</b> | Sarah Bonema   | Effects of VACM-1/Cul5 Gene Knockout in T47D Breast Cancer Cells Using CRISPR-Cas9   |
| <b>46</b> | John Larson  | Development of a Rapid Screening Assay to Detect Trafficking Defective Mutants of System $x_c^-$   |
| <b>47</b> | Kevin Catalfano  | Use of Site-Directed Mutagenesis to Probe the Cystine Binding Site within System $x_c^-$   |
| <b>48</b> | Mackenzie Schmidt, Dylan Sabo  | Development of an Assay to Measure Ubiquitination Status of System $x_c^-$   |
| <b>49</b> | Mackenna Senti, Alicia Bostwick, Kyle Ross, Julia Wilson   | Regulation of Mitochondrial DNA Transcription by Post-Translational Modifications of Mitochondrial Transcription Factor B2                           |
| <b>50</b> | Alicia Bostwick, Mackenna Senti, Catherine Wingrove, Alexandra Wyeth, Gonzalo Moya, Alexandra Poland | Post-Translational Modifications of Mitochondrial Proteins MRPL12 and POLRMT as a Potential Regulatory Mechanism for Mitochondrial DNA Transcription |

### Biology

Mentors: Drs. Aaron Best, Maria Burnatowaska-Hledin, Gerald Griffin, Benjamin Kopek, Brent Krueger, Virginia McDonough, Vanessa Muilenburg, K. Greg Murray, Jonathan Peterson, Michael Pikaart, Phillip Rivera, Joseph Stukey, Kathy Winnett-Murray; and Michelle Gibbs, MS

- |           |   |   |
|-----------|---|---|
| <b>61</b> | Sarah Dible   | Cross Regulation of Phospholipid and Unsaturated Fatty Acid Biosynthesis          |
| <b>62</b> | Cindy Nguyen, Mikayla Coombs                                  | Role Phosphatidylcholine in Viral Replication                                     |
| <b>63</b> | Emma Wabel, Schuyler Brunink                                  | Knockout of Truncated VACM-1(KLB22) in HUVEC Using CRISPR-Cas9                    |
| <b>64</b> | Carleigh Robinson   | Generation of Viral Vectors for Gene Expression in Avian Species                  |
| <b>77</b> | Samuel Heilman, Sally Hakim, Emily Hamilton, Marissa Lockwood | Wildlife Activity Patterns at a Constructed Wetland Based On Trail Cam Monitoring |

78	Katelyn DeWitt	Environmental Value of Trees in the City of Holland
79	Analise Sala, Micaela Wells	Assessing Hemlock Woolly Adelgid Impact on West Michigan Dune Forests
80	Ryan Woodside	Murray Research Project
81	Riley Draper, Austin Smith	Arv1 Influences the regulation of Stearoyl-CoA desaturase
82	Megan Lopez, Anna Molloy, Isabelle Bertolone, Jonathan Outen, Carleigh Robinson, Jessica Liu, Hannah Tegtmeier, Mikayla Coombs	Genomic Analysis of Novel Mycobacteriophage Philly
83	Angela Vito	Does Genome Structure Influence Bacteriophage Fitness?
95	Jade Laughlin, Tena Baar	Dominican Republic Water Quality Study Using Point-of-Use Water Filters
96	Jacob Peecher, Shannon Smith	Utilizing qPCR Methods to Investigate <i>Escherichia coli</i> Replication in Freshwater Environments
97	Eric Schumann, Abby Pearch, Richard Pellizzari	Environmental Factors Affecting Bacterial Community Composition in the Hypereutrophic Macatawa Watershed
98	Chris Belica, Brandon Bonilla, Ford Fishman	Genomic and Physiological Characteristics of Novel <i>Escherichia</i> Strains Isolated from Freshwater Sources
99	Paula Nolte, Victoria Parker	Understanding the Impact of Chronic Low-Dose, Low Energy, Proton Radiation on Systemic Inflammation and Anxiety-Like Behaviors in Mice
100	Jeomoni Julion Figueroa, Paulina Kozan	Characterization of Exogenous Label of Glial Cells in The Mouse Brain
101	Kayla Russell, Noah Weigle	Testing the Impact of Neuronal Damage on HSV-1 Latency
102	Zoe Gum, Anna Vostrizansky	The Developmental Time Course of Photoreceptors in Ducks
103	Matthew Gross, Kayla Brady, Mikayla Zobeck, Emma Beemer, Sara Filippelli, Victoria Parker, Morgan Malaga, Shane McAuthur	Genomic Analysis of Novel Mycobacteriophage Paphu
104	Bethany Van Houten, Geordan Stukey	Bacteriophages Known for Broad Mycobacterial Host Range Also Appear Well-Adapted for Growth on the Soil Microorganism <i>Mycobacterium smegmatis</i>

## Chemistry

Mentors: Drs. Mary Elizabeth Anderson (Furman University), Aaron Best, Kenneth Brown, Leah Chase, Amanda Eckermann, Jason Gillmore, Jeffrey Johnson, Brent Krueger, Donald T. Morelli (Michigan State University), K. Greg Murray, William Polik, Aaron Putzke (Whitworth University), Elizabeth Sanford, Matthew L. Smith, and Christopher Turlington

2	John Peterson	Transition Metal Complexes and their Effect on Amyloid-Beta Oligomerization
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3	Emily Eaton, Marissa Solorzano	Investigating the Role of xCT in Neuroregeneration
4	Kimberly Breyfogle	Parameterizing Fluorescent Protein Chromophores for Molecular Dynamics Simulations
5	Zachary Snoek, Anna Prins	The Next Generation of High Performance Computing Clusters Using Containerization
6	Julian Payne	PyScan: Interfacing Laboratory Instruments with Python
19	Matthew R. Ammerman, Derrick Obiri-Yeboah	Development of an Electrochemical Glucose Sensor Using Iron Porphyrin Substituted Polymer Films
20	Grace Kunkel, John Rogers	Solution-Phase Synthesis and Thermoelectric Characterization of n- and p-type Tetrahedrite Nanoparticles
21	Macy Maraugh	Investigating the Physical and Electrical Properties of Copper-Paddlewheel Surface-Anchored Metal-Organic Frameworks
22	Madelyn Orndorff, Macy Maraugh	Morphological Differences in Electropolymerized EDOT Films
23	Sydney Gross, Madelyn Orndorff, Macy Maraugh	Preparation and Characterization of a Highly Fluorinated Hydrophobic EDOT Film
24	Alyssa VanZanten, Macy Maraugh	Tailoring the Material Properties of Surface-Anchored Metal-Organic Frameworks
37	Michael Giurini	Development of New Electrode Surfaces for Glucose Biosensors
38	Kjersti Oberle, Jared Lowe	New Directions for Organocatalyzed Polymerization Reactions
39	Gretchen Fata, Anna Bauer, Nick Weigle, Chloe Hutchison	Poly(4-vinylpyridine)-N-oxide as a Polymer-Supported Oxygen Atom Transfer Reagent
40	James Bird, Sarah Olen, Ryan Lash	Oxygen Atom Transfer to Molybdenum and Ruthenium Complexes
41	Addison M. Duda	Sonogashira Routes to Phenyleneethynylenes for Photomechanical Polymeric Systems
42	Marcus Brinks	Thiol-Yne Reactions for Incorporating Longer Wavelength Azo Dyes into Polymeric Photomechanical Materials
55	Carmen Chamberlain, Karissa Libson	Kinetics of Strontium Leaching from Doped Nanoparticles
56	Gregory Cahill, Matthew Olson	Rhodium-Catalyzed Carbon-Carbon Bond Activation Utilizing Removable Amide Directing Groups
57	Erik Schoonover, Gregory Campbell	Examination of the Reaction Mechanism of the Rhodium-Catalyzed Decarbonylation of Pyridyl Ketones
58	Ethan Heyboer, Rebecca Johnson	Synthesis of Ortho-Substituted Benzamides Through Nickel Mediated Cross-Coupling
59	Brandon Derstine, Addison Duda	Ethynyl-functionalized Azo Dye Monomers for Photomechanical Applications

<b>60</b>	Eleda Plouch	Isolation and Identification of Fungistatic Compounds from the Seeds of Pioneer Species
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## Communication

Mentors: Drs. Marissa Doshi, Roger Nemeth, and Deirdre Johnston

<b>181</b>	Annah Duffey	A Cultural Analysis of Twenty One Pilots
<b>183</b>	Jenny Lussenhop	The Complex Role of the Church in South Africa in the Justification of Apartheid, Racial Reconciliation, and the Anti-Apartheid Struggle
<b>184</b>	Leah Asen	Sheryl Sandberg: A Look at Women in the C-Suite
<b>191</b>	Itzayana Zuniga	Trangenerational Trauma

## Computer Science

Mentors: Drs. Charles Cusack, Mike Jipping, Ryan McFall, and Vicki Voskuil, with Tricia Kragt

<b>7</b>	Caleb Tallquist, Louis Kopp	Bilancio: An Easy Way to Manage Your Money
<b>8</b>	Josiah Brouwer, Josiah Brett	Graphics Processing Units (GPUs) and CUDA
<b>9</b>	Phil Caris, Dennis Towns	Vitalis

## Economics and Business

Mentors: Drs. Marcus Fila, and Steven McMullen

<b>138</b>	Sarah Gargan	The Effect of a Changing Marriage Age on Marriage Continuity
<b>139</b>	Leah Overbeek	Investigating the Role of Gender in Job Satisfaction
<b>140</b>	Gordon VanWieren III	Neighborhood Effects on the Educational Attainment of First-Generation Immigrants
<b>141</b>	Quincey Glupker	The Impact of Immigration on Wages in the United States
<b>142</b>	Yizhe Zhang	The Impact of Income Differentials on the Decision to Immigrate
<b>143</b>	Nicholas Schanhals	The Impact of Immigration on Wages: An Empirical Analysis Controlling for Skill-Level
<b>144</b>	Olivia McCalla	The Impact of Unemployment on Wage Rates
<b>148</b>	Reece Lindemann, Caleb Hoekstra	Delineating Higher Education Faculty Stress: Examining the Role of Resources on Stressor-Strain Relationships from Teaching, Research, and Service
<b>149</b>	Andy Atkinson	The Effects of Educational Attainment on U.S. Welfare Duration
<b>150</b>	Heather Bonga	Returns to Education: An Investigation into the Role of Gender in Post-Graduation Salary
<b>151</b>	Sarah Mozdren	The Effects of Health Insurance on Alcohol Consumption: Analyzing the Existence of Moral Hazard

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<b>152</b>	Grant Taylor Miller	The Effect of Air Quality on Labor Market Participation
<b>153</b>	Kellen Gove	Exploring the Impact of Long Work Hours on Physical Health Outcomes
<b>154</b>	Mason Schut	Diversification of Wealth and Wealth Management across Socioeconomic Status
<b>155</b>	Christian Rhoades	The Effects of Minimum Wage Laws on SNAP Enrollment in the United States
<b>156</b>	Thomas Kouwe	The Effect of Maryland's Minimum Wage Hike on Employment: A Synthetic Control Analysis

### Education

Mentors: Drs. Jane FinnVicki-Lynn Holmes, and Stephen Scogin

<b>105</b>	Abby Couwenhoven, Montserrat Dorantes	How Pre-Service and In-Service Teachers' Philosophies Affect Their Perceived Value of STREAM School
<b>106</b>	Reese Yount	The Value of Outdoor-Based Programs on Students' Growth: Does PBL-Based Learning Actively Enhance Students' Soft Skills?
<b>107</b>	Elisabeth Cole	CASA Enrichment Program 2018
<b>108</b>	Reganne Diener, Jessica McAlpine	Communication Participation: Let's Have a Party!

### Engineering

Mentors: Drs. Miguel Abrahantes, Courtney Peckens, Katharine Polasek

<b>85</b>	Michael Dennis, Barry Bait	EEG Analysis of Physically and Electrically Activated Sensation
<b>86</b>	Joseph Krockner	A Model of Selective Activation Using Surface Electrical Stimulation
<b>87</b>	Camille Fogg	Bio-Inspired Iterative Learning Techniques for More Effective Control of Civil Infrastructure
<b>88</b>	Rachel Foy	Bio-Inspired Control of Civil Infrastructure
<b>89</b>	Cedric Porter, Taylor Rink	Wireless Sensor Networks for Long-Term Monitoring of Urban Noise
<b>90</b>	Kyle Hydorn	Multi-Robot Communication and Coordination

### English

Mentors: Drs. Natalie Dykstra, Curtis Gruenler, Marsley Kehoe and Kendra Parker

<b>201</b>	Hannah Barnes	Disability in Black Women's Speculative Fiction
<b>203</b>	Rebecca Stanton	The Fitzgeralds in France: A Life of Splendor and Tragedy
<b>204</b>	Rachel Schaller	"I don't know, but together we can live"(Mononoke): Mimetic Theory, Levinisian Phenomenology, and Princess Mononoke

## Geological and Environmental Sciences

Mentors: Drs. Aaron Best, Brian Bodenbender, Edward Hansen, Paul Pearson, Jonathan Peterson, Michael Pikaart, Brian Yurk; Professor Suzanne DeVries-Zimmerman; also Sarah Brokus, Frank Moen, and Randy Wade

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|-----------|---|--|
| <b>73</b> | Elizabeth Morehead, Cleveland Tarp  | The Role of Water-Fluxed and Water-Undersaturated Melting in Garnetiferous Amphibolites across a Metamorphic Transect in the Eastern Segment of the Sveconorwegian Orogen, SW Sweden |
| <b>74</b> | Jonas Peterson, Jacob VanderRoest, Daniel Wade  | A New Approach for Determining Size Distributions of Very Fine Particles in Aqueous Suspensions  |
| <b>75</b> | Alexandra Donaldson   | Using Remote Sensing to Evaluate Historic and Current Hydroecological Changes in a Great Lakes Interdunal Wetland/Slack  |
| <b>76</b> | Jacob Stid  | Using Drone Acquired, High-Resolution, Multispectral Imaging to Predict and Monitor Coastal Dune Mobility: An Example from the Southeastern Shore of Lake Michigan                   |
| <b>91</b> | Amy Olgers, Chelsea Moore   | A Reconnaissance of Microplastic Distribution in the Lake Macatawa Watershed   |
| <b>92</b> | Erin Kahn, Liam Kleinheksel, Carolyn Cooper, Chris Belica, Eric Schumann, Brandon Bonilla   | Monitoring of Chemical and Physical Water Quality Parameters in the Macatawa Watershed   |
| <b>93</b> | Benjamin Fry, Jonas Peterson, Jacob Stid  | A Reconnaissance Survey of Metals in Untreated Drinking Water around the World   |
| <b>94</b> | Daniel Wade, Jacob VanderRoest, Cleveland Tarp, Jacob Stid, Jonas Peterson, Josiah Peterson | A Global Reconnaissance Survey of Untreated Drinking Water Sources: Potential Relationships to Worldwide Metadata  |

## History

Mentors: Drs. Lauren Janes, Jeanne Petit, and Pamela Koch

- |            |              |  |
|------------|--------------|--|
| <b>186</b> | Halla Maas   | Hope College and the Vietnam War               |
| <b>193</b> | Madie Lynema | Congolese Education                            |
| <b>194</b> | McKenna Stam | Historical Analysis of Independence in the DRC |

## Kinesiology

Mentors: Drs. Kirk Brumels, Kevin Cole, Maureen Dunn, Mark Northuis, Brian Rider, and Leigh Sears; and Professors Annie Carrigan, Timothy Koberna, Katharine Rose, and Stein Slette

- |            |                                     |   |
|------------|-------------------------------------|---|
| <b>160</b> | Austin Hemenway, Sophie Kleinheksel | Examining Changes in Sleep Habits, Physiological Variables, and Physical Activity Behaviors in Division III Female Soccer Players during a Competitive Season |
| <b>161</b> | Zebulon Broersma                    | Complications of Arthrofibrosis in an ACL Repair and Rehabilitation   |
| <b>162</b> | Leela Thomas Parrish                | The Rehabilitation of a Nonoperative SLAP Tear  |

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164	Melanie Weesies	Anterior Ankle Impingement in a Collegiate Football Player
165	Paige Kaufman	Conservative Treatment of an L5/S1 Herniated Disc in an Electrical Lineman: A Case Study
166	Chandler Kirinovic	Little Time, Big Impact: A Concussion Case
167	Kelly Peregrine	Deterioration Rate of Running Shoe Function over First 200 Miles of Wear
168	Thomas Sprys-Tellner, Brooke Hedglen	Examining the Impact of Facial Expressions on Running Economy
172	Sarah Neumar, Lillianne Vogt	The Effect of a Maltodextrin Mouth Rinse Solution on 5k Treadmill Time Trials in Endurance Trained Collegiate Athletes
173	Eliza Beird, Hilary Curry, Jason Beckman, Jack Sojka	The Effect of the VKTRY Insoles on Vertical Jump and Broad Jump
174	Colten Stuive, Betsy Craig, Eliza Beird, Caroline Serkaian	Examining the Accuracy of the Polar OH1 Monitor
175	Timothy Pletcher, Stephen Rivas, Colten Stuive	Delayed Onset Muscle Soreness Following Acute Resistance Training in Occluded vs. Non-Occluded Limbs
176	Beth Fransted, Vanessa Reynhout, Adam Hudson	The Effect of Caffeine on Delayed Onset Muscle Soreness and Vertical Jump in Collegiate Female Volleyball Players
177	Angela Mascari, Savannah Tallman, Evan Augustine, Kaylee Arendt	Validity of Wahoo Tickr Fit Heart Rate Monitor
178	Lauren DeYoung, Allison Mann, Houston Bedford, Jared Stygstra	The Effect of Peppermint Essential Oil on VO <sub>2</sub> max and Ventilatory Threshold in Active College Students
179	Kristen Marsman, Elyse Smalley, Mackenzie Greendyke	Validation of the PolarV800 Watch VO <sub>2</sub> Max Prediction
180	Grace Ditzenberger, Thomas Sprys-Tellner, Betsy Craig, Brooke Hedglen, Nick Brohl	The Impact of Fluid Ingestion on Intermittent Cycling in Male Lacrosse Athletes in a Hot Environment

### Mathematics

Mentors: Drs. Yew-Meng Koh, and Eric Mann; Professor Susan Ipri Brown

65	John McMorris	Using Factor Analysis in Variable Selection and Clustering of US Mass Shooting Incidents
66	Tyler Gast	Classifying and Predicting US Mass Shooting Incidents
84	Julia Hardy, Erica Slenk	Engineering the Future Academy

### Mellon Scholars Program

Mentors: Drs. Natalie Dykstra, Marsley Kehoe, and Jesus Montaña

185	Keyshara Hudson, Amelia Waalkes, David Wang, Abigail Venlet	The Importance of the Virgin Mary as an Icon and the Evolution of Her Representation
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|------------|---|--|
| <b>187</b> | Sarah Herrera   | The Art of Moving Across Borders: A Look into Translanguage Literature                         |
| <b>188</b> | Kellyanne Fitzgerald                                      | Found in Translation: The Complexities of Edgar Allan Poe in Translation by Charles Baudelaire |
| <b>190</b> | Laura Anthon, Jamie Breyfogle, Tim Embertson, Natalie Weg | The Forgotten Expedition of the Michigan Polar Bears   |

## Modern and Classical Languages

Mentors: Drs. Tatevik Gyulamiryan, and Brigitte Hamon-Porter

- |            |                 |  |
|------------|-----------------|--|
| <b>182</b> | Carolyn Cooper  | Women without Fear: Women in the French Resistance |
| <b>189</b> | Jamie Breyfogle | An Analysis of Fear in Don Quixote                 |

## Music

Mentor: Dr. Sarah Southard, Music

- |            |                    |   |
|------------|--------------------|---|
| <b>200</b> | Mikayla Battistone | The Importance of Music Programs for At-Risk Youth within Urban Schools |
|------------|--------------------|---|

## Neuroscience

Mentors: Drs. Leah Chase, and Gerald Griffin

- |           |  |  |
|-----------|--|--|
| <b>67</b> | Noah Weigle  | Impact of HSV-1 on an in vitro Model of Traumatic Brain Injury                       |
| <b>68</b> | Nina McAlvey, Mercedes Rede, Samantha VanHoven, Samuel Wolfe   | Does NMDA Receptor Inhibition Prevent HCA-Induced Manic/Depressive Behavior in Rats? |
| <b>69</b> | Emily Zolman, Elizabeth Woodford, Kenia Urena-Gonzalez, Jared Stygstra, Peter Stewart, Nicholai Shaw, Allison Lindquist, Anna Langholz, Erin English, Marny Ehmann | Testing the Impact of Prebiotics on Anxiety-like Behaviors in Aged Male Rats         |

## Nursing

Mentors: Drs. Anita Esquerra-Zwiers, Emilie Dykstra Goris, Vicki Voskuil, and Barbara Vincensi; Stephanie Mullennix, MS, RN, CEN, AGCNS-BC, Carol Shaffer, MS, RN, Rachel Jacoby, RN; David Blauw and Sharon Knibbe of Holland Hospital

- |           |  |  |
|-----------|--|--|
| <b>10</b> | Alexandra Vroom, Emma Johnson, Anastasia Perecki, Lauren Czmer | Mother's Milk for Michigan Infants: Exploring the Personal, Social, and Biological Factors of Maternal Milk Supply |
| <b>11</b> | Sophia Jarzembowski  | Analysis of Surgical Personnel Traffic in the Operating Room   |
| <b>12</b> | Emma Boerema   | Analysis of Operating Room Traffic in Orthopedic Surgical Cases versus Non-Orthopedic Surgical Cases               |
| <b>13</b> | Rebecca Chema  | Theory of Planned Behavior: Examining Breastfeeding Intentions and Behaviors                                       |

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14	Noah Bertolone	Relationship between Identified Delirium Symptoms and Falls Rates in a Non-ICU Setting
15	Kendra Grulke	Evaluating Evidence-Based Practice in a Local Wound Program
16	Sarah Stroup	Exploring the Physical Activity Behavior and Needs of Adolescent Girls Using Activity Trackers: A Mixed-Methods Study
17	Caroline Finn	Evolution of Patient Dependent Fall Risk Factors in the Emergency Department
18	Gretta Nyboer	The Effects of Self-Reported Spiritual Importance on Patient Satisfaction With Chaplaincy Services

### Phelps Scholars

Mentor: Professor Yolanda Vega

192	Ernesta Cole	Phelps Scholar Alumni Project
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### Physics

Mentors: Drs. Paul DeYoung, Peter Gonthier, Jennifer Hampton, and Stephen Remillard

25	Brittany Devlin	Comparing the Intercalation of Na, Mg, and Al in Prussian Blue Analogues
26	Kamaron Wilcox	The Effect of Potassium Hexacyanoferrate (III) Concentration on Prussian Blue Analogue Charge Storage
27	Jacob Kelley	Study of Charge Transfer Quantities of Prussian Blue Analogues Using Electrochemical Impedance Spectroscopy
28	Scott Joffre	Comparing Electrochemical Analysis and Particle Induced X-Ray Emission Measurements of Prussian Blue Analogue Deposits
29	Forest Rulison	Ion beam Analysis for Silicon Carbide Crystals and Battery Materials
30	Meredith Bomers	Developing a General Spin Dependent Compton Scattering Cross-Section in Strong Magnetic Fields
31	Madeleine Rabitoy	Implementing the FIDO Model in a Pulsar Population Synthesis
32	Zachary Kellner	Generating Depth Profiles of Semiconductors Using Rutherford Backscattering Spectroscopy
33	Alexander Medema	Effects of Columnar Defects on Microwave Nonlinearity in a Superconducting YBCO Resonator
34	Anna Wormmeester	Local Whole-Device Scanning of Distortion in Superconducting Microwave Resonators
35	Jason Gombas	Determining the Beta-decay Intensity Function for Unstable Nuclei
36	William von Seeger	Determining the $\beta$ Decay Strength Function of $^{91}\text{Rb}$

## Political Science

Mentors: Drs. Virginia Beard, Rachel Schutte, and Todd Wiebe

<b>112</b>	Kinzly Dressler, Braden Griffin	Swing Vote Influencers on Congressional Roll Call in 2018
<b>113</b>	Taylor White	Does the Digital Divide Exist and How is it Affecting Africa?
<b>114</b>	Makena Mugambi	Does the Digital Divide Exist and How is it Affecting Africa?
<b>115</b>	Claire Bates	Is There a “Resource Curse” and What does Africa Reveal about Its Existence and Impact on Political and Economic Stability and Development?
<b>116</b>	Luke Rufenacht	The Resource Curse in Africa
<b>117</b>	DeVante Cosby	Foreign Aid and African Political and Economic Development?
<b>118</b>	Sanny Yang	Foreign Aid and African Political and Economic Development
<b>119</b>	Molly Douma, Maryah Phillips	Public Opinion and Influences on Government Assistance
<b>123</b>	Elisabeth Beck	The Role of Minority Parties in Coalition Governments
<b>124</b>	Kinzly Dressler	Trends in Roe Roll Call Voting
<b>125</b>	Emily Marino	Geographical Coercion: Land Dividing the U.S. Along Partisan Lines
<b>126</b>	Katheryn Irwin	Rural Brain Drain
<b>127</b>	Abigail Finnegan	Women and Political Participation
<b>128</b>	Madison Smith	Political Polarization and Voter Turnout
<b>129</b>	Maddie Smith, Nazareth Frezghi	Global Politics: Political Culture B
<b>130</b>	Isabel Hodson, Andrew Porter, Audrey Revercomb	Political Opinion
<b>131</b>	Natalie Harten, Michelle Abraham	Global Politics: Political Behavior A
<b>132</b>	Mike Boynton, Sophia Rachor	Global Politics: Political Culture A
<b>135</b>	Yung Yue Tneh	Influences of Political Scandals on Political Participation
<b>136</b>	Erick Núñez	Living in Fear: The Politics of Sanctuary Cities
<b>137</b>	PJ Johnson	Social Media Usage and Political Participation

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## Psychology

Mentors: Drs. Alyssa Cheadle, Andrew Gall, Gerald Griffin, Lindsey Root Luna, Benjamin Meagher, Katelyn Poelker, Sonja Trent-Brown, and Charlotte vanOyen Witvliet

<b>51</b>	Lauren Evert, Gonzalo Moya	Mixed Mood State Behaviors and Circadian Dysfunction following Homocysteic Acid Treatment: Potential Animal Model for Bipolar Disorder
<b>52</b>	Rebecca Messnick, Lauren Evert, Cameron Everse, Micah Manthei, Abby Rakus	Biopsychosocial Correlates of Sleep Hygiene in Preschoolers
<b>53</b>	Lauren Evert, Cameron Everse, Rebecca Messnick, Micah Manthei, Abby Rakus	The Impact of Parent Awareness on Preschoolers' Sleep
<b>54</b>	Ciara Brennan, Nolan Krause, John Dyke	Revealing Functional Brain Activity Following Excitotoxic Injury to Retinal Ganglion Cells in a Diurnal Rodent Model
<b>70</b>	Nicholai Shaw, Lilly Hemesath, Nina Cuthrell	The Association between the Postpartum Period and Depressive Symptoms
<b>71</b>	Anna Langholz	Associations Between Social Support and Positive Psychosocial Variables in Pregnant Women
<b>72</b>	Lauren Thorne, Allison Darnell, Yuankun Gu	Resilience and Health in College Students
<b>121</b>	Amy Beasley	Evidence for Equality?: Guatemalan Adolescents' Views on Gender
<b>122</b>	Jana Sahyouni, Sydney Hudock	Who I Am: A Mixed-Methods Analysis of Guatemalan Adolescents' Identity Development
<b>133</b>	Hannah Bugg	Self-Regulation Predicts Virtue and Flourishing, above and beyond Self-Control
<b>134</b>	Ashley Hayden, Katrina Clayton, William Lake, Isabelle Matthews, Jonah Oman, Emily Peterson, Matthew Schuiling, Amanda Schultz	The Psychophysiology of Accountability
<b>145</b>	Victoria Gardner, Samantha Stall, Michala Ringquist, Caitlyn Heidenga, Isabel Cunningham	The Relationship between Resilience and Acute Stress
<b>146</b>	Michala Ringquist, Caitlyn Heidenga, Bailey Butler, Sarah Altieri	Sit Down. Be Humble: Assessing Intellectually Humble Behaviors in Groups and Individuals
<b>147</b>	Reece Lindemann, Kimberly Paquette	Work Stress and Pregnancy
<b>157</b>	Abigail Meder, Elizabeth Woodford, Darby Baird, Nathalia Santos	Acoustic Parameters of Child Speech
<b>158</b>	Darby Baird, Abby Meder, Elizabeth Woodford, Nathalia Santos	Child Speaker Identification: Accuracy, Reaction Time, and Engagement with Children
<b>159</b>	Nathalia Santos, Abigail Meder, Darby Baird, Elizabeth Woodford	Exploring the Effects of Contextual Influences on Cognitive Processing through the Use of Silent Centers

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Mentor: Dr. Steven Hoogerwerf

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| 110 | Karissa Libson | Caring for Difficult Patients: A Workshop Identifying Challenges and Opportunities |
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## Sociology and Social Work

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| 170 | Hannah Kenny      | Hope College and Ready for Life: Kate's Story                                  |
| 171 | Jacob Wantoch     | Medical Students and the Kind of Doctors They Are Becoming                     |

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Mentors: Dr. Daina Robins; Professors Michelle Bombe, Reagan Chesnut, Perry Landes, Richard Perez, and Richard Smith

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| 196 | Emmie Sandstedt | Stage Management of <i>The Seagull</i> |
| 197 | Gracen Barth    | Stage Management of <i>Crooked</i>     |
| 198 | Megan Clark     | <i>Cry It Out</i> Costume Design       |
| 199 | Katie Joachim   | <i>Cry It Out</i> Stage Management     |

## Women's and Gender Studies

Mentor: Drs. Kendra Parker, Lynn Japinga, and Fred Johnson III

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| 195 | Kamryn Ramsay  | Legalized Abortion and Women's Health: The True Defender of Life |
| 202 | Cadence Jones  | Hysteria: A Look at Sexism in Medicine                           |

An abstract book and a sampling of posters from this event can be viewed on Hope's Digital Commons Repository on the Van Wylen Library website ([digitalcommons.hope.edu](http://digitalcommons.hope.edu)) beginning in May. The abstract book will also be available as a .pdf on the Celebration website ([celebration.hope.edu](http://celebration.hope.edu)) for a limited time.

## Celebration of Undergraduate Research and Creative Activity

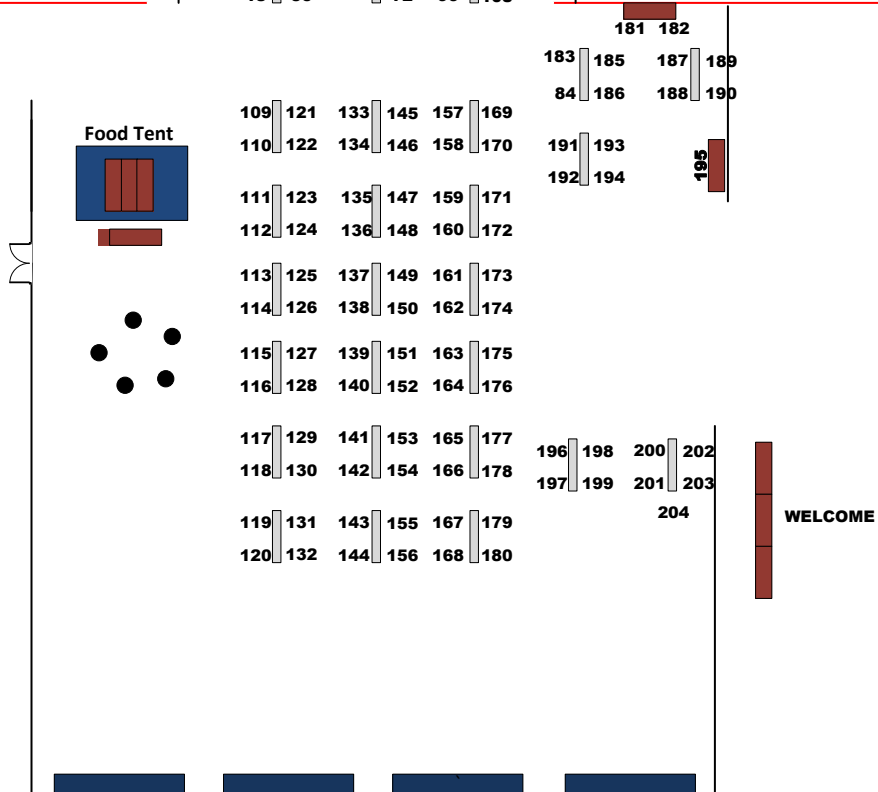
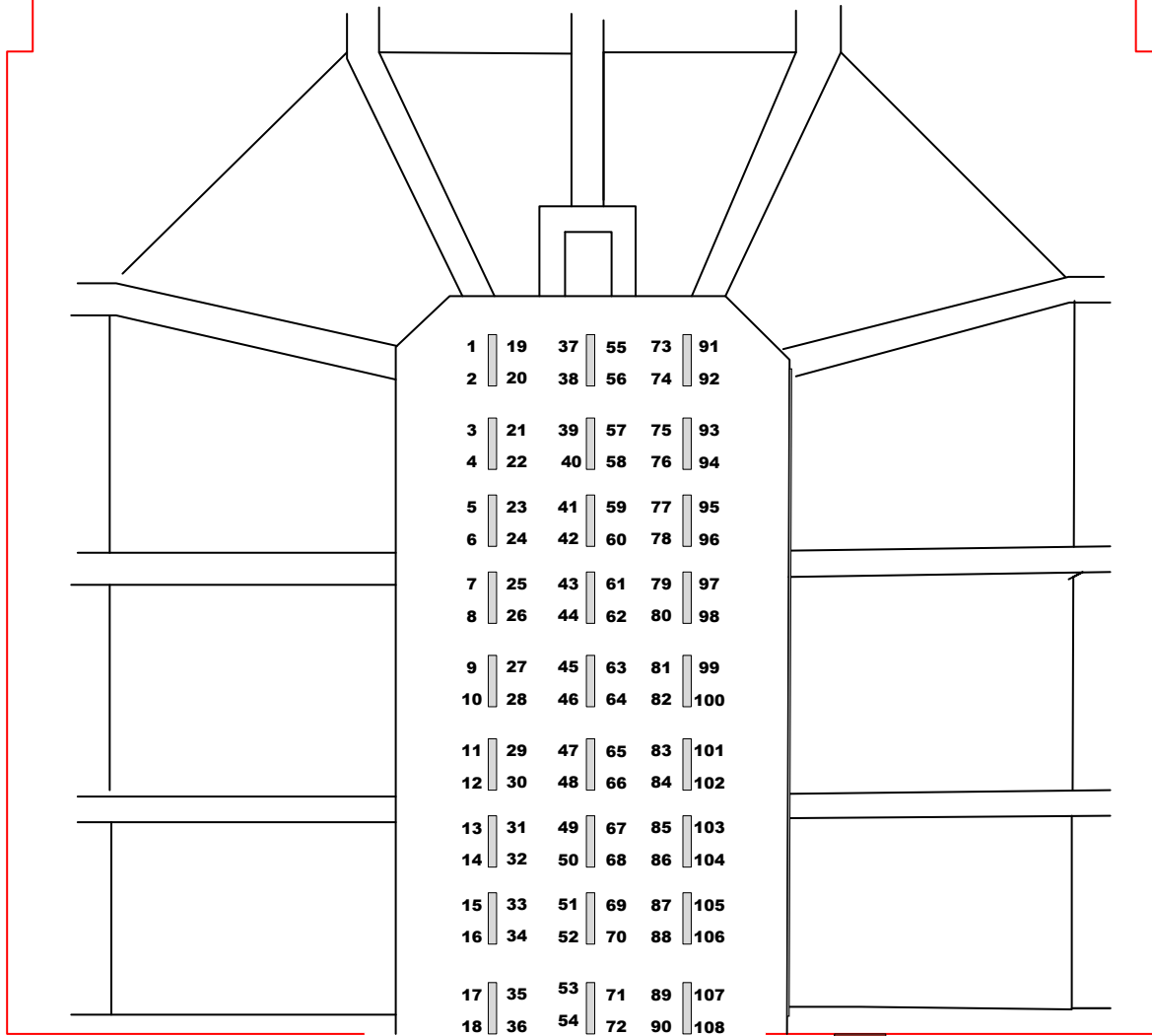
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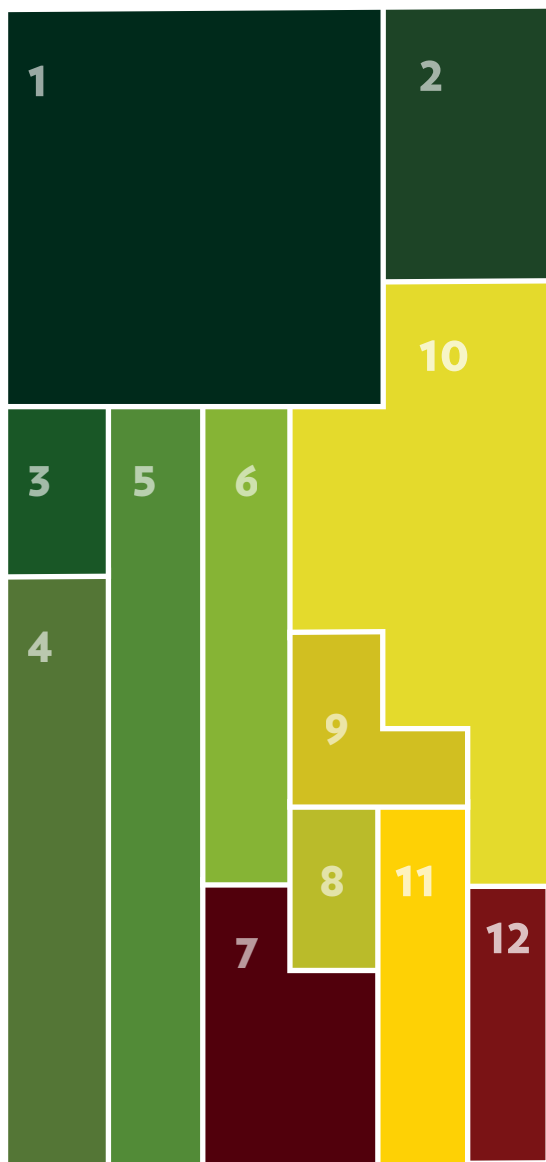
## Celebration of Undergraduate Research and Creative Activity

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NORTH-END BLEACHERS



# THE 18<sup>TH</sup> ANNUAL CELEBRATION OF UNDERGRADUATE RESEARCH AND CREATIVE ACTIVITY

POSTER AND PRESENTATION MAP

## KEY

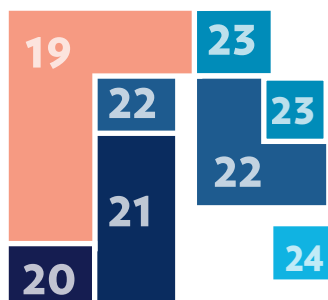
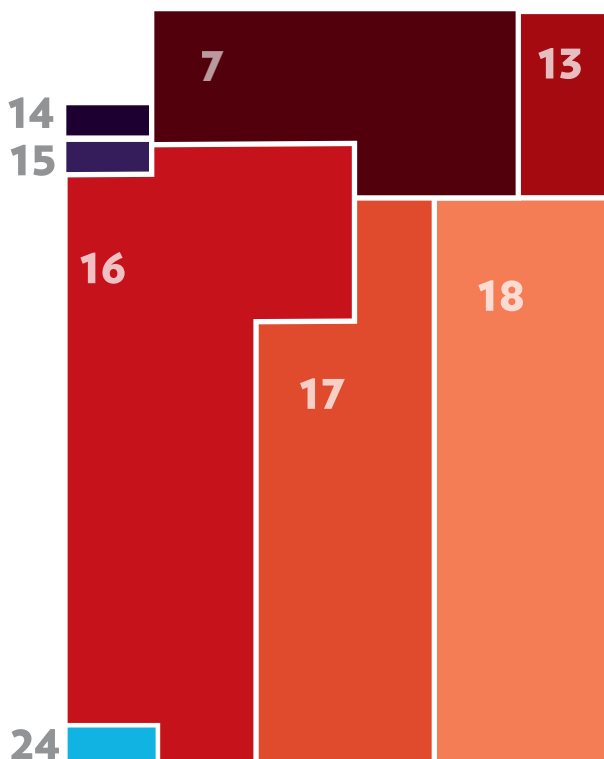
NATURAL AND APPLIED SCIENCES

SOCIAL SCIENCES

ARTS AND HUMANITIES

- |                                     |                            |                                  |
|-------------------------------------|----------------------------|----------------------------------|
| 1. Chemistry                        | 10. Biology                | 19. Communication                |
| 2. Geological & Environmental Sci.  | 11. Engineering            | 20. Phelps Scholars              |
| 3. Computer Science                 | 12. Education              | 21. History                      |
| 4. Nursing                          | 13. Sociology/ Social Work | 22. Mellon Scholars              |
| 5. Physics                          | 14. Religion               | 23. Modern & Classical Languages |
| 6. Biochemistry - Molecular Biology | 15. Art & Art History      | 24. Women's & Gender Studies     |
| 7. Psychology                       | 16. Political Science      | 25. Theatre                      |
| 8. Neuroscience                     | 17. Economics & Business   | 26. English                      |
| 9. Mathematics                      | 18. Kinesiology            | 27. Music                        |

FOOD TENT



ENTRANCE



STUDENT WELCOME  
AND NAME TAGS TABLE