MINNESOTA ACADEMY OF SCIENCE

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85th Annual Meeting of the Minnesota Academy of Science

&

31st Winchell Undergraduate Research Symposium

Celebrating 31 Years of Excellence in Undergraduate Research

UNIVERSITY OF St.Thomas

University of St. Thomas, St. Paul, MN **April 21, 2018**

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About the Annual Meeting & Winchell Undergraduate Research Symposium

The Annual Meeting & Winchell Undergraduate Research Symposium provides a forum for undergraduate students to present research in the sciences, learn from professionals in fields they aspire to enter, and receive recognition for their accomplishments.

The first Annual Meeting of the Minnesota Academy of Science was held on April 15, 1933 at the University of Minnesota. Over the years, the annual meeting took on several forms, ranging from lectures to archaeological excursions. In 1981, the Board of Directors decided to add an undergraduate research symposium hosted in conjunction with the Annual Meeting.

There are four main components of the meeting and symposium – a keynote lecture, poster presentations, oral presentations, and breakout sessions. More than 125 students, research advisors, members of MAS, faculty members, and other interested members of the community attend the symposium each year.

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University of St. Thomas

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Macalester College, Department of Biology	**University of St. Thomas**, Departments of Chemistry and Health and Human Performance; Undergraduate Research Opportunities Program

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Schedule of Events – April 21, 2018

8:00 – 8:45 a.m.	Registration	Anderson Student Center (ASC) 3rd Floor
8:45 – 9:00 a.m.	Welcome Remarks Dr. Josh Layfield & Dr. Bill Heidcamp	Woulfe Alumni Hall (ASC 378)
9:00 – 10:00 a.m.	Keynote Address Dr. Christy Haynes	Woulfe Alumni Hall
10:00 a.m. – 12 p.m.	Oral Presentations	
	Chemistry and Physics	Woulfe Alumni Hall
	Ecology and Environmental Science	ASC 364
	Cell Biology and Physiology	ASC 365
	Biochemistry and Molecular Biology	ASC 366
12:00 – 12:30 p.m.	Break / Pick up Box Lunch	Woulfe Lounge (ASC 380)
12:30 – 1:30 p.m.	Breakout Sessions	
	Workshop on Salaries in the Sciences	ASC 365
	Tour of UST Gardens	Gather in Woulfe Lounge
	Panel on Options after College	Woulfe Alumni Hall
1:30 – 2:00 p.m.	Poster Session Set-up / Networking Break	Woulfe Alumni Hall
2:00 – 2:45 p.m.	First Poster Session (Odd Numbers)	Woulfe Alumni Hall
2:45 – 3:30 p.m.	Second Poster Session (Even Numbers)	Woulfe Alumni Hall
3:30 – 4:00 p.m.	Closing Remarks, Thanks, and Awards	Woulfe Alumni Hall

Keynote Speaker

Dr. Christy Haynes

Professor Christy Haynes completed her undergraduate work at Macalester College in 1998 and earned a Ph.D. in chemistry at Northwestern University in 2003. Before joining the faculty at the University of Minnesota in 2005, Haynes performed postdoctoral research at the University of North Carolina, Chapel Hill.

Among many honors, Haynes was named a 2010 Alfred P. Sloan fellow and a National Institutes of Health "New Innovator," won the Royal Society of Chemistry's Joseph Black Award as well as the 2015 Sara Evans Faculty Woman Scholar/Leader Award sponsored by the University of Minnesota Office for Faculty and Academic Affairs and the Women's Center. Haynes has recently been awarded a prestigious 2018 Guggenheim Foundation Fellowship based on prior achievement and exceptional promise. Haynes is one of only 173 scientists, scholars, and artists in the United States and Canada to receive the highly competitive national fellowship.

Haynes is currently associate department head of the Department of Chemistry and the Elmore H. Northey Professor of Chemistry at the University of Minnesota. She is also associate director of the Center of Sustainable Nanotechnology, and an associate editor of *Analytical Chemistry*.

Haynes will speak about her research on the "Design and Redesign of Sustainable Engineered Nanomaterials." Even Richard Feynman would be impressed with how engineered nanoparticles are increasingly being incorporated into devices and products across a variety of commercial sectors. However, this means that engineered nanoscale materials will either intentionally or unintentionally be released into the ecosystem. The long-term goal of the presented work is to understand the molecular design rules that control nanoparticle toxicity using aspects of materials science (nanoparticle design, fabrication, and modification), analytical chemistry (developing new assays to monitor nanotoxicity), and ecology (monitoring how nanoparticles enter and accumulate in the food web through bacteria and how these nanoparticles influence bacterial function). Taken together, these data suggest that careful consideration of engineered nanoparticle surface chemistry will likely allow design of safe and sustainable nanoscale materials.

Oral Session Schedule (10:00 a.m. – 12:00 p.m.)

Woulfe Auditorium: Chemistry and Physics

10:00 **EXPLORATION FOR NEW, FACILE SYNTHETIC APPROACHES TO BISPHOSPHINE MONOXIDES**
Safa Aiyana Mahina and Joseph Kent West (Advisor)
Department of Chemistry
Winona State University, Winona, MN

10:15 **GCMS DETERMINATION OF TERPENE CONCENTRATION IN THE CONTEXT OF THE MOUNTAIN PINE BEETLE**
Kate J. Rynders[1], Kevin D. Chase[2], Mitchell P. Maddox[1] (Advisor), and Brian H. Aukema[2] (Advisor)
[1] *Department of Chemistry*
Bethel University, St. Paul, MN
[2]*Department of Entomology*
University of Minnesota, St. Paul, MN

10:30 **NOVEL SYNTHESIS OF NEW OXAZOLIDINONE ANTIMICROBIAL AGENT**
Ashley Roux and J. Thomas Ippoliti (Advisor)
Department of Chemistry
University of St. Thomas, St. Paul, MN

10:45 **BREAK**

11:00 **SYNTHESIS OF NEW BISFERROCENYL-SCHIFF BASE COMPOUNDS AND THEIR PT(II) COMPLEXES**
Robert J. Walters and Joseph K. West (Advisor)
Department of Chemistry
Winona State University, Winona, MN

11:15 **ZIRCONIUM PHOSPHATE BEHAVIOR DURING WASHING**
Mark Mitmoen and Ken Rohly (Advisor)
Department of Chemistry
Bethel University, St. Paul, MN

11:30 **FEASIBILITY OF PELTIER CHIPS AS THERMOELECTRIC GENERATORS ON HEATSINKS**
Matthew Choquette, Dillon Ranstrom, and Bruce Bolon (Advisor)
Department of Physics
Hamline University, St. Paul, MN

American Chemical Society

Oral Session Schedule (10:00 a.m. – 12:00 p.m.)

ASC 364: Ecology and Environmental Science

10:00 **CHARACTERIZATION OF GRAY SQUIRREL (*Sciurus carolinesis*) LEAF NESTS ON AN URBAN COLLEGE CAMPUS**
Brooke Maruska and Joseph Whittaker (Advisor)
Department of Biology
Concordia College–Moorhead, Moorhead, MN

10:15 **LEAD CONTENT IN THE LIVERS OF SOUTHEASTERN MINNESOTA MALLARDS (*Anas platyrhynchos*)**
William Grillo and Raymond Faber (Advisor)
Department of Biology
St. Mary's University of Minnesota, Winona, MN

10:30 **SELECTIVE TREE USAGE IN BARK-FORAGING BIRDS: IMPLICATIONS FOR EMERALD ASH BORER**
Abigail Valine and Dale Gentry (Advisor)
Department of Biology & Biochemistry
University of Northwestern–St. Paul, St. Paul, MN

10:45 **BREAK**

11:00 **A MATHMATICAL MODEL OF SOLAR ENERGY, TEMPERATURE, AND ALTITUDE: AN APPLICATION FOR HIGH-ALTITUDE BALLOONS**
Akshay Naik and James Flaten (Advisor)
Department of Aerospace Engineering
University of Minnesota–Twin Cities, Minneapolis, MN

11:15 **IDENTIFYING *Peromyscus leucopus* AND *P. maniculatus* USING SALIVARY AMYLASE**
Gift Ben-Bernard, Elli Strand, and Joseph Whittaker (Advisor)
Department of Biology
Concordia College–Moorhead, Moorhead, MN

Oral Session Schedule (10:00 a.m. – 12:00 p.m.)

ASC 365: Cell Biology and Physiology

10:00 **EFFECT OF TBX2 EXPRESSION ON GROWTH AND APOPTOSIS OF SKBR3 CELLS TREATED WITH HER2 NEUTRALIZING ANTIBODY**
Tabitha Hanson and Matthew Rowley (Advisor)
Department of Biology
St. Mary's University of Minnesota, Winona, MN

10:15 **INHIBITION OF TBX2 EXPRESSION IN THE T47D BREAST CANCER CELL LINE REDUCES CELL MOBILITY**
Kathryn Frye and Matthew Rowley (Advisor)
Department of Biology
St. Mary's University of Minnesota, Winona, MN

10:30 **OVEREXPRESSION OF TBX2 AND EPIREGULIN HAVE NO EFFECT ON INVASION OF SKBR3 CELLS IN A BOYDEN CHAMBER ASSAY**
Kaitlin Kling and Matthew Rowley (Advisor)
Department of Biology
St. Mary's University of Minnesota, Winona, MN

10:45 **BREAK**

11:00 **MI IS IN THE AIR: CHARACTERIZING THE ALLERGIC RESPONSE TO INHALED METHYLISOTHIAZOLINONE IN MICE**
Rachel Poli, Ruby Kinnamon, and Devavani Chatterjea (Advisor)
Department of Biology
Macalester College, St. Paul, MN

11:15 **ALTERNATIVELY SPLICED PLAKOGLOBIN ACTIVATES WNT/BETA-CATENIN SIGNALING IN AN IPSC MODEL OF ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY**
Rosemary Cobb and Randy Daughters (Advisor)
Department of Biology
Macalester College, St, Paul, MN

11:30 **CONTRACTILE EFFECTS OF BLUE COHOSH ON *Mus musculus* DISTAL COLON**
Hayley Cermin and Teresa DeGolier (Advisor)
Department of Biology
Bethel University, St. Paul, MN

11:45 **CONTRACTILE RESPONSE OF *Mus musculus* STOMACH TISSUE AFTER APPLICATION OF BLUE COHOSH AND TWO OF ITS CONSTITUENTS**
Andrew Kremer and Teresa Degolier (Advisor)
Department of Biology
Bethel University, St. Paul, MN

Oral Session Schedule (10:00 a.m. – 12:00 p.m.)

ASC 366: Biochemistry and Molecular Biology

10:00 **GLUTATHIONE S-TRANSFERASE EXPRESSION IN EMBRYONIC LIVERS OF *Gallus gallus* EXPOSED TO ATRAZINE IN OVUM**
Haley Colton and Debra Martin (Advisor)
Department of Biochemistry
Saint Mary's University of Minnesota, Winona, MN

10:15 **VEGF-B AND FABP4 EXPRESSION IN MICE (*Mus musculus*) EXPOSED *in utero* TO ATRAZINE**
Jeremy Heinle and Debra Martin (Advisor)
Department of Biology
Saint Mary's University of Minnesota, Winona, MN

10:30 **BIOPHYSICAL CHARACTERIZATION OF G-QUADRUPLEX DNA LIGAND BINDING FOR A FLUORESCENT PROBE N-METHYL MESOPORPHYRIN IX**
Patrick Brennan and Thomas Marsh (Advisor)
Department of Chemistry
University of St Thomas, St. Paul, MN

10:45 **BREAK**

11:00 **COMPARISON OF ANTIMICROBIAL PROPERTIES OF THE CIS AND TRANS ISOMERS OF DICHLOROBIS(ETHYLENEDIAMINE)COBALT(III) CHLORIDE**
Angela Messer, Jeanne Minnerath[1] (Advisor), and Brett Bodsgard[2] (Advisor)
[1]Department of Biology
[2]Department of Chemistry
St. Mary's University of Minnesota, Winona, MN

11:15 **THE PEPTIDE THAT BROKE THE MOUSE'S BACK: ASSESSING THE ROLE OF THE NEUROPEPTIDE TLQP-21 AND ITS IMMUNE RECEPTOR C3AR1 IN SPINAL CORD INJURY PAIN**
Amy Chan and Lucy Vulchanova (Advisor)
Department of Neuroscience
University of Minnesota–Twin Cities, Minneapolis, MN

11:30 **ANTI-INFLAMMATORY EFFECTS OF *Helichrysum italicum* ON RAW 264.7 MACROPHAGES**
Stephanie Peterson and Joyce Doan (Advisor)
Department of Biology
Bethel University, St. Paul, MN

Breakout Sessions (12:30 – 1:30 p.m.)

Participants are asked to pick up a box lunch in the Woulfe Lounge (ASC 380) between 12:00 and 12:30 p.m. and then proceed to the breakout session they selected during registration. You are welcome to continue eating during the sessions!

Salaries in the Sciences: What Can You Expect? ASC 365

***Dr. Ishuan Li**, Associate Professor of Economics, Minnesota State University-Mankato*

Tour of the Medicinal Garden, Pollinator Path, and Science Artwork at the University of St. Thomas Gather in Woulfe Lounge

***Dr. Amy Verhoeven**, Professor of Biology, University of St. Thomas*

Exploring Options After College with Recent Graduates Woulfe Alumni Hall

Moderator:

***Dr. Afshan Ismat**, Assistant Professor of Biology, University of St. Thomas*

Panelists:

***Brian Bustrom**, Research Chemist at Microtrace Solutions*
***Kiersten Idzorek**, First-year law student at the University of St. Thomas*
***Ryan Merry**, Third-year graduate student at the University of Minnesota*
***Quinn Niederluecke**, Graduate student at the University of Minnesota and the Minnesota Department of Agriculture*

UNIVERSITY OF St.Thomas

Poster Session by Poster Number

1 **IDENTIFYING PROTEINS IN ALCOHOLIC FATTY LIVER DISEASE**
Sunny Vuong and Laura Listenberger (Advisor)
Departments of Chemistry and Biology
St. Olaf College, Northfield, MN

2 **ANNOTATION OF *Drosophila eugracilis* CHROMOSOME 3L Contig 65**
Hinsoukpo Dagan and Tamara L. Mans (Advisor)
Department of Biology
North Hennepin Community College, Brooklyn Park, MN

3 **"GREENER" METHOD FOR THE SYNTHESIS OF PHOSPHINE SELENIDES**
Der Vang and Joseph Kent West (Advisor)
Department of Chemistry
Winona State University, Winona, MN

4 **ATTAINING HIGH SPECIES DIVERSITY IN PRAIRIES WITH LOW INITIAL RESTORATION INVESTMENT**
Wesley Braker[1] and Stuart Wagenius[2] (Advisor)
[1]Department of Biology
St. Olaf College, Northfield, MN
[2]Program in Plant Biology and Conservation
Northwestern University, Evanston, IL

5 **CRANIAL PROSTHESIS FOR CHRONIC, PAN-CORTICAL TWO-PHOTON IMAGING IN BEHAVING MICE**
Nahom Mossazghi, Leila Ghanbari, Mathew Ryans, Russell Carter, Judith Dominguez, Jay Jia Hu, Suhasa Kondandaramaiah[1] (Advisor) and Timothy Ebner[2] (Advisor)
[1]*Department of Mechanical Engineering*
[2]*Department of Neuroscience*
University of Minnesota–Twin Cities, Minneapolis, MN

6 **LIPOTOXICITY: UNDERSTANDING THE MECHANISM THAT LEADS FROM SATURATED FATTY ACID TO CELL DEATH**
Margaret Brown, **Hannah Nilsson**, and Laura Listenberger (Advisor)
Departments of Chemistry and Biology
St. Olaf College, Northfield, MN

7 **CHARACTERIZING AMMONIUM TRANSPORTERS OF THE CYANOBACTERIUM *Anabaena***
Livianna K. Myklebust and Tami R. McDonald (Advisor)
Department of Biology
St. Catherine University, St. Paul, MN

8 **A THREE-STEP SYNTHESIS OF AVOBENZONE**
Tanifa Nguyen, **Ashley Wilke**, and James Wollack (Advisor)
Department of Chemistry
St. Catherine University, St. Paul, MN

9 **COMPARISON OF SMALL MAMMAL COMMUNITIES ON RESTORED AND REMNANT PRAIRIES IN NORTHWESTERN MINNESOTA**

Chloe Whitten, **Emma Detloff**, and Joseph Whittaker (Advisor)
Department of Biology
Concordia College–Moorhead, Moorhead, MN

10 **DEVELOPMENT AND TESTING OF AUTOMATED ELECTROMECHANICAL ICE THICKNESS MONITORING SYSTEM**

Charles A. Lundquist, Tyler Holmes, Thomas G. Shepard (Advisor), and Thomas Rodengen (Advisor)
School of Engineering
University of St. Thomas, St. Paul, MN

11 **THE EFFECTS OF MORPHOLOGY ON THE LUMINESCENT PROPERTIES OF UPCONVERTING LANTHANIDE DOPED PHOSPHORS**

Cecelia Kinane, J. Thomas Ippoliti[1] (Advisor), and Brittany Nelson-Cheeseman[2] (Advisor)
[1]*Department of Chemistry*
[2]*School of Engineering*
University of St. Thomas, St. Paul, MN

12 **DIFFERENTIAL PROTEIN EXPRESSION OF FIBROLAMELLAR HEPATOCELLULAR CARCINOMA (FL-HCC)**

Tierra Bender[1], Rondell Graham[2], Linda Hasadsri[2], Adam Hildebrandt[1], Lauren Magnuson[1], **Desiree A. Reding[1]**, Michael Torbenson[2] and Mary Ann Yang[1] (Advisor)
[1]*Department of Biology*
Concordia University–St. Paul, St. Paul, MN
[2]*Mayo Clinic, Rochester, MN*

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Taylor Bell and Joseph Kent West (Advisor)
Department of Chemistry
Winona State University, Winona, MN

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Jacob Carson, **Kaitlin Marsaa**, and Pamela Freeman (Advisor)
Department of Biology
The College of Saint Scholastica, Duluth, MN

15 **LOCALIZED SURFACE PLASMON SPECTROSCOPY ON SELF-ASSEMBLED AU@SILICA–PD HETERODIMERS**

Sihoon Moon, John Caputo, and Vivian E. Ferry (Advisor)
Department of Chemical Engineering and Materials Science
University of Minnesota–Twin Cities, Minneapolis, MN

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Joseph A. Romo and Dennis D. Cao (Advisor)
Department of Chemistry
Macalester College, St. Paul, MN

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Brenna Walton and Amy Verhoeven (Advisor)
Department of Biology
University of St. Thomas, St. Paul, MN

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Taylor Olin and Andrea Kalis (Advisor)
Department of Biology
St. Catherine University, St. Paul, MN

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Alexandra Ward and Graeme R. A. Wyllie (Advisor)
Department of Chemistry
Concordia College–Moorhead, Moorhead, MN

20 **SYNTHESIS OF Gd-DETA-MAM FOR THE RECYCLING OF PHOSPHATE**
Austin L. MacRae,[1] **Amanda S. Tran**,[1] Katie L. Peterson[1] (Advisor), and Valerie C. Pierre[2] (Advisor)
[1]*Department of Chemistry*
Bemidji State University, Bemidji, MN
[2]*Department of Chemistry*
University of Minnesota–Twin Cities, Minneapolis, MN

21 **FINDING FOSSILS AND THE PALEOENVIRONMENT OF MONTANA'S HELL CREEK FORMATION**
Breann Adamek, Ron Nellermoe (Advisor), and Joseph Whittaker (Advisor)
Department of Biology
Concordia College–Moorhead, Moorhead, MN

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Department of Biology
Concordia University, St. Paul, MN

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Ange-Gabrielle M. Holm, Paula C. Furey[1] (Advisor), and James W. Wollack[2] (Advisor)
[1]Department of Biology
[2]Department of Chemistry
St. Catherine University, St. Paul, MN

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Darian Wisecup, Taylor Mach (Advisor), and Amanda Brosnahan (Advisor)
Department of Science
Concordia University, St. Paul, MN

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Jocelyn Ricard and Logan Spector (Advisor)
Department of Pediatrics, Division of Epidemiology
University of Minnesota–Twin Cities, Minneapolis, MN

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Department of Chemistry
University of St. Thomas, St. Paul, MN

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Bethany A. Palen, Emily Landgreen, and Joseph K. West (Advisor)
Department of Chemistry
Winona State University, Winona, MN

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Samuel Willard and Jonathan Schilling (Advisor)
Department of Plant and Microbial Biology
University of Minnesota–Twin Cities, Minneapolis, MN

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Department of Physics
Hamline University, St. Paul, MN

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Caleb Wenck and Mitchell Maddox (Advisor)
Department of Chemistry
Bethel University, St. Paul, MN

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Department of Chemistry
Rochester Community and Technical College, Rochester MN

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Department of Hematology and Oncology
University of Minnesota–Twin Cities, Minneapolis, MN

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Department of Chemistry
Bemidji State University, Bemidji, MN

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Department of Biology
St. Olaf College, Northfield, MN

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Department of Biology
Viterbo University, La Crosse, WI

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Division of Global Pediatrics
University of Minnesota–Twin Cities, Minneapolis, MN

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Department of Chemistry
Bethel University, St. Paul, MN

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Haleigh Ortmeier-Clarke and Candice Hirsch (Advisor)
Department of Agronomy and Plant Genetics
University of Minnesota–Twin Cities, Minneapolis, MN

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Nhu Nguyen and Dennis Cao (Advisor)
Department of Chemistry
Macalester College, St. Paul, MN

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Department of Chemistry
Winona State University, Winona, MN

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Department of Chemistry
St. Olaf College, Northfield, MN

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Department of Plant Pathology
University of Minnesota, St. Paul, MN

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Department of Chemistry
Rochester Community and Technical College, Rochester MN

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Department of Plant Pathology
University of Minnesota, St. Paul, MN

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Department of Chemistry
Bethel University, St. Paul, MN

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Department of Chemistry
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Kellie Stellmach and Dennis Cao (Advisor)
Department of Chemistry
Macalester College, St. Paul, MN

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Tyler Ogorek and J. Thomas Ippoliti (Advisor)
Department of Chemistry
University of St. Thomas, St. Paul, MN

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Department of Chemistry
St. Catherine University, St. Paul, MN

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Jasmin Bretoi and Kenneth Rohly (Advisor)
Department of Chemistry
Bethel University, St. Paul, MN

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Ajinkya Limkar and Marco Pravetoni (Advisor)
Department of Medicine and Pharmacology
University of Minnesota–Twin Cities, Minneapolis, MN

52 **UTILIZING PROTEIN PRENYLATION TO MODIFY EpCAM-TARGETING DARPins WITH AN AZIDE-CONTAINING ISOPRENOID ANALOG**
Shelby Auger[1] and Mark Distefano[2] (Advisor)
Department of Chemistry
[1]*St. Catherine University, St. Paul, MN*
[2]*University of Minnesota–Twin Cities, Minneapolis, MN*

Full abstracts may be found

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Poster Session by Category

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Cermin, Hayley 11:30, ASC 365
Chan, Amy 11:15, ASC 366
Choquette, Matthew 11:30, Woulfe
Cobb, Rosemary 11:15, ASC 365
Colton, Haley 10:00, ASC 366
Frye, Kathryn 10:15, ASC 365
Grillo, William 10:15, ASC 364
Hanson, Tabitha 10:00, ASC 365
Heinle, Jeremy 10:15, ASC 366
Kling, Kaitlin 10:30, ASC 365
Kremer, Andrew 11:45, ASC 365
Maruska, Brooke 10:00, ASC 364
Messer, Angela 11:00, ASC 366
Mitmoen, Mark 11:15, Woulfe
Naik, Akshay 11:00, ASC 364
Peterson, Stephanie 11:30, ASC 366
Poli, Rachel 11:00, ASC 365
Roux, Ashley 10:30, Woulfe
Rynders, Kate 10:15, Woulfe
Strand, Elli 11:15, ASC 364
Valine, Abigail 10:30, ASC 364
Walters, Robert 11:00, Woulfe

Poster Session by Last Name

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