



MINNESOTA ACADEMY OF SCIENCE
—Promoting Excellence in Science Since 1873—

**87th Annual Meeting of the
Minnesota Academy of Science
&
33rd Winchell Undergraduate
Research Symposium**

Celebrating 33 Years of Excellence in Undergraduate Research

Held virtually April 24, 2021

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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 original STEM research, 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.

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

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University of St. Thomas, Department of Chemistry

and the Undergraduate Research Opportunities Program

Schedule of Events – April 24, 2021

The main Zoom session will be open throughout the symposium.

9:00-9:10 **Opening Remarks**
Welcome & Speaker Introduction by Aisha Thomas PhD, Crown College

9:10-10:00 **Keynote Address**
*"The Dangers of Driving with a Broken Engine" by
Jim Maher PhD, Bernard Pollack Professor of Biochemistry & Molecular
Biology; Director, Mayo Clinic Initiative for Maximizing Student Development
(IMSD) and Post-Baccalaureate Research Education Program (PREP), Mayo
Clinic College of Medicine and Science, Mayo Clinic Rochester*

10:15-11:45 **Student Presentations** [*see p. 8-14 for list of student presenters & subjects*]
● *Student Presentations session 1 - 7*

Students will receive the judges' written comments by email after the symposium.

12:00-12:45 **Breakout Sessions**

- *Graduate & Professional School Panel
(Moderator: Joanna Klein PhD)*
- *Biomedical Career Path Planning for Undergrads and Their Advisors
(Speaker: Jim Maher PhD)*
- *Science Professional Panel
(Moderator: Jessica Bell PhD)*
- *MAS Annual Meeting, featuring K-12 STEM Education Update
(Moderators: Stephanie Yancey PhD and Lara Maupin)*
- **Video Recording:** *Responsible Conduct of Research: Reproducibility
(This 22-minute video will continue to be available after the symposium.)*

1:00-1:20 **Closing Remarks & Awards**
*Judges' Choice awards, TriBeta awards, PLUS random drawing for 2 Caribou
gift cards (must be present to win)*

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Leya Charles, Prairie Island Indian Community & Montana State University

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Scott Kelley, Itron

Riley Lewis, University of Minnesota - Twin Cities

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Terri Mattila PhD, University of Minnesota - St. Paul

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Amy Verhoeven PhD, University of St. Thomas

Graeme Wyllie PhD, Concordia College - Moorhead

Stephanie Yancey PhD, Beckman Coulter

Keynote Speaker

Dr. Jim Maher

As a researcher, professor and dean at the Mayo Clinic and Mayo Graduate School since 1995, Dr. Jim Maher has pursued multiple scientific interests, mentored many PhD students, and advocated for diversity in the biomedical research workforce. Jim is particularly proud of his educational accomplishments related to student training, initiating an Office for Diversity in Education at Mayo Clinic, consolidating support for undergraduate summer research experiences for underrepresented students, and leading long-running NIH grants supporting enrichment for diverse post-baccalaureate and graduate students.



Dr. Maher's laboratory has three major research interests: 1. The origin and management of DNA flexibility. 2. Combinatorial selection of nucleic acids for therapeutic purposes. 3. Understanding the molecular basis of human familial paraganglioma cancer.

Jim has a personal inspiration for the cancer research in his lab: "As a paraganglioma patient for more than 45 years, I have been fascinated by how an inherited defect in an enzyme of the TCA cycle (succinate dehydrogenase; SDH) is carcinogenic in neuroendocrine cells. The lab is creating and studying cell and animal models to understand this rare and fascinating cancer. We are interested in epigenetic dysregulation in the nucleus caused by the toxicity of mitochondrial succinate accumulation on dioxygenase enzymes, and hyperacetylation of chromatin. We hypothesize that the unique metabolic features of SDH-loss cells will create unique opportunities for non-toxic therapies."

Breakout Sessions (12:00 – 12:45pm)

Graduate & Professional School Panel

Moderator: **Joanna Klein PhD**, Professor of Biology & Chair, Department of Biology and Biochemistry at University of Northwestern - St. Paul

Panelists: **Abbigail Christensen**, DVM Candidate, Class of 2023 - Iowa State University College of Veterinary Medicine; MPH Candidate, Class of 2022 - University of Iowa College of Public Health

Hannah Dunn, Second-year Graduate student-MS Occupational Therapy Program, University of Wisconsin- La Crosse

Seth Erickson, Fourth-year PhD student in Optical Science, University of Arizona

Brady Griffith, PA-C, Physician Assistant in Emergency Medicine, Ridgeview Medical Center

TJ Studer, MD, Diagnostic Radiology Resident, University of Minnesota

Biomedical Career Path Planning for Undergrads and Their Advisors

Speaker: **Jim Maher PhD**, Bernard Pollack Professor of Biochemistry & Molecular Biology; Director, Mayo Clinic Initiative for Maximizing Student Development (IMSD) and Post-Baccalaureate Research Education Program (PREP), Mayo Clinic College of Medicine and Science, Mayo Clinic Rochester

Science Professional Panel

Moderator: **Jessica Bell PhD**, Faculty at Century College

Panelists: **Felicia De Santos PhD**, Associate Principal R&D Scientist, One Global Dairy, General Mills Inc.

Daryl Ellison MA, Area Fisheries Supervisor, West Metro Area Fisheries, Minnesota Department of Natural Resources

Farhiya Farah PhD, MPH, Director, Assistant Professor, Public Health Programs, St. Mary's University of Minnesota

Pat Grady PhD, Research Scientist, University of Minnesota Genomics Center

Michele (Shellie) Kieke PhD, MS, LGC, Licensed Genetic Counselor, former Associate Professor of Biology, HealthPartners/Regions Hospital, St. Paul, MN

(continued)

Breakout Sessions (continued)

MAS Annual Meeting, featuring *K-12 STEM Education Update*

Moderators: *Stephanie Yancey PhD, MAS Board President, and Lara Maupin, MAS Executive Director*

Speakers: *Sarah Carter, STEM & Computer Science Specialist, MN Department of Education*

John Olson, Science Specialist, MN Department of Education

Video Recording: Responsible Conduct of Research: Reproducibility

*This 22-minute video, produced for Winchell by the University of Minnesota's **Many Faces of Reproducibility** project reproducibility.umn.edu, will continue to be available after the symposium, as well as the presentation slides.*

Student Presentation Schedule (10:15-11:45 am)

[Student presenters are shown in bold.]

Student Presentations session 1

1.1 Biochemistry: **DETECTION OF ATRAZINE METABOLITES IN BLOOD SERUM AND LIVER OF MICE EXPOSED VIA THEIR WATERS TO 0, 3, AND 30 PPB ATRAZINE**

McKenna R. Gaalswyk and Debra Martin (Advisor)

Department of Biochemistry

St. Mary's University of Minnesota, Winona, MN

1.2 Biochemistry: **SERTRALINE BINDING TO THE S1S2 DOMAIN OF IONOTROPIC GLUTAMATE RECEPTOR GLUN1 SUBUNIT**

Alexander Host and Lisa Gentile (Advisor)

Department of Chemistry

College of Saint Benedict - Saint John's University, St. Joseph and Collegeville, MN

1.3 Cellular / Molecular Biology: **FROM SOIL TO *Pseudomonas*: THE JOURNEY OF A BACTERIUM IN THE TINY EARTH RESEARCH STUDY**

Marie Anderson and Joanna Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

1.4 Cellular / Molecular Biology: **ANALYZING THE ANTIBIOTIC PRODUCTION AND GENOME OF A *Pseudomonas* STRAIN FROM THE SOIL**

Jessica G. Crosson, Kayla Petry, and Joanna Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

1.5 Neuroscience: **INFLUENCE OF HEAVY ALCOHOL EXPOSURE ON THE CHRONIC PAIN MECHANISM**

Rachel Schorn and Lucy Vulchanova (Advisor)

Department of Neuroscience

University of Minnesota, Minneapolis, MN

Student Presentations session 2

2.1 Biochemistry: **ALTERNATIVE CARDIAC PACEMAKER MECHANISM**

Savannah Martinson and Gary Mumaugh (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, Roseville, MN

2.2 Biochemistry: **EFFECTS OF THE P126E MUTATION ON MALATE DEHYDROGENASE'S SPECIFIC ACTIVITY AND TURNOVER NUMBER**

Justin Thoreen, Cora Stallcup, Tavia Tran, and Betsy Martínez-Vaz (Advisor)

Department of Biochemistry

Hamline University, St. Paul, MN

2.3 Biochemistry: **ANALYSIS OF CIRCADIAN PLASMA CORTISOL LEVELS IN ATRAZINE EXPOSED MICE**

Delaney Wolf, Nathan Lien (Advisor), and Debra Martin (Advisor)

Department of Chemistry

St. Mary's University of Minnesota, Winona, MN

2.4 Cellular / Molecular Biology: **EXAMINATION OF THE EXPRESSION OF ETV1 DURING LUNG DEVELOPMENT IN *Xenopus laevis* IN RESPONSE TO FGF SIGNALING**

Haley Miller and Brian Hyatt (Advisor)

Department of Biology

Bethel University, St. Paul, MN

2.5 Cellular / Molecular Biology: **DETECTION OF AN ANTIBIOTIC PRODUCING *Pseudomonas* BACTERIUM FROM SOIL**

Danielle Ertsgaard and Joanna Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

Student Presentations session 3

3.1 Biochemistry: **IS CYCLIC ELECTRON TRANSPORT IMPORTANT FOR PHOTOPROTECTION DURING WINTER STRESS IN *Pinus strobus* AND *Pinea glauca*?**

Joan C. Kornkven and Amy S. Verhoeven (Advisor)

Department of Biology

University of St Thomas, St. Paul, MN

3.2 Biochemistry: **THE ROLE OF FFAR4 IN NAFLD/NASH**

Sophee Schwanberg, Katherine Woller, Xavier Revelo (Advisor), Angela Stoeckman (Advisor)

Departments of Chemistry and Biology

Bethel University, St. Paul, MN

3.3 Biochemistry: **DESIGNING A 3D PHYSICAL MODEL OF HIV PROTEASE TO EXAMINE BIOCHEMICAL INTERACTIONS AND DRUG RESISTANCE TO TIPRANAVIR AND DARUNAVIR**

Cindy Van Acker, Sherina Dyrma, Asha Nooh, Alessia Palacios, and Betsy Martínez-Vaz (Advisor)

Department of Biochemistry

Hamline University, St. Paul, MN

3.4 Cellular / Molecular Biology: **DISCOVERY OF AN ANTIBIOTIC PRODUCING BACTERIUM**

Lilia Gidenko and Joanna Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

3.5 Cellular / Molecular Biology: **IDENTIFICATION OF DRUGS POTENTIALLY INVOLVED IN PLANARIAN REGENERATION FROM A SCREEN OF A DRUG-GENE INTERACTION DATABASE**

Andy Yang and Aeisha Thomas (Advisor)

Department of Mathematics and Science

Crown College, St. Bonifacius, MN

Student Presentations session 4

4.1 Cellular / Molecular Biology: **INVESTIGATION OF ANTIBIOTIC-PRODUCING SOIL BACTERIA**

Kendall Luman and Joanna Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

4.2 Cellular / Molecular Biology: **CAPTIVITY CONVERGES THE MICROBIOMES OF DIVERSE PRIMATE SPECIES**

Maya Wills, Madison Johnson, Emily Brunmeier, Tami Murphy, Timothy Johnson, Dan Knights, Jonathan B. Clayton, and Robin R. Shields-Cutler (Advisor)

Department of Biology

Macalester College, St. Paul, MN

4.3 Cellular / Molecular Biology: **THE EFFECT OF TBX2 OR EPIREGULIN ON THE ACTIVATION OF EGFR, HER2, HER3, AND HER4 IN THE MCF10A CELL LINE**

Graham Lorsung and Debra Martin (Advisor)

Department of Biology

St. Mary's University of Minnesota, Winona, MN

4.4 Ecology / Environmental Sciences: **LEAF RADIOCARBON AND REMOTE SENSING REVEAL LEGACIES OF REDLINING IN MIDWESTERN CITIES**

Elizabeth Hrycyna, Saiido Noor, Jennings Mergenthal, Xiaomei Xu, and Mary Hessel (Advisor)

Department of Biology

Macalester College, St Paul, MN

4.5 Ecology / Environmental Sciences: **SEASONAL CHANGES IN BLACK-CAPPED CHICKADEE FORAGING AND BEHAVIORAL PATTERNS**

Haley Sargent and Dale Gentry (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

Student Presentations session 5

5.1 Cellular / Molecular Biology: **HOW DOES NLRP2 CONTROL FETAL DEVELOPMENT?**

Nayeon Son, Matthew So, and Christopher Lupfer (Advisor)

Department of Biology

Missouri State University, Springfield, MO

5.2 Cellular / Molecular Biology: **SHIFTING THE BALANCE IN FAVOR OF ANTI-INFLAMMATORY MICROGLIA/MACROPHAGES IN ISCHEMIC BRAIN INJURY WITH NH-UCBSC AND IL-13 TREATMENT**

Mayuresh Vernekar and Walter Low (Advisor)

Department of Neurosurgery, College of Biological Sciences

University of Minnesota - Twin Cities, Minneapolis, MN

5.3 Cellular / Molecular Biology: **DISCOVERY AND ANALYSIS OF ANTIBIOTIC PRODUCING *Streptomyces* FROM SOIL**

Nicholas C. M. Waughtal and Joanna R. Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

5.4 Ecology / Environmental Sciences: ***Echinacea angustifolia* SEEDLING PERSISTENCE DOES NOT VARY WITH MICROHABITAT CHARACTERISTICS OR FLORAL NEIGHBORHOOD IN FRAGMENTED PRAIRIE**

Emma Greenlee¹, Mia Stevens², Stuart Wagenius² (Advisor)

¹*Department of Biology*

Carleton College, Northfield, MN

²*Echinacea Project*

Chicago Botanic Garden, Chicago, IL

5.5 Ecology / Environmental Sciences: **CALL CHARACTERISTICS OF SOUTHERN FLYING SQUIRREL (*Glaucomys volans*) VOCALIZATIONS IN MISSOURI**

Cole Van Houten and Ben Pauli (Advisor)

Department of Biology

St. Mary's University, Winona, MN

Student Presentations session 6

6.1 Cellular / Molecular Biology: **WARTBURG COLLEGE TINY EARTH PILOT PROGRAM: SOIL BACTERIA AND ANTIBIOTIC DISCOVERY**

Hanna E. Schmitt, **Jenna E. Smuszkiewicz**, and Sean Coleman (advisor)

Department of Biology

Wartburg College, Waverly, IA

6.2 Cellular / Molecular Biology: **THE IDENTIFICATION OF AN ANTIBIOTIC-PRODUCING ISOLATE FROM SOIL**

Amy Sullivan and Joanna Klein (Advisor)

Department of Biology and Biochemistry

University of Northwestern - St. Paul, St. Paul, MN

6.3 Ecology / Environmental Sciences: **ACCUMULATION OF 17 α -ETHINYLESTRADIOL IN POOL 6 OF THE MISSISSIPPI RIVER**

Mackenzie Waters and Debra Martin (Advisor)

Department of Biology

St. Mary's University, Winona, MN

6.4 Ecology / Environmental Sciences: **EFFECTS OF GOAT GRAZING INTENDED FOR *Rhamnus cathartica* ON SURROUNDING FORBS AND NATIVE WOODY PLANT SPECIES ON BETHEL UNIVERSITY'S CAMPUS**

Jenna Ronken and Sara Wyse (Advisor)

Department of Biology

Bethel University, St. Paul, MN

6.5 Organismal / Physiological Sciences: **AN ANALYSIS OF DESICCATION TOLERANCE OF THE FERN *Polypodium virginianum***

Catherine Putzier and Amy Verhoeven (Advisor)

Department of Biology

University of St Thomas, St. Paul, MN

Student Presentations session 7

7.1 Chemistry: **REACTIVITY OF VINYL HYDROPEROXIDES AND NEW REARRANGEMENT PATHWAYS IN ISOPRENE OZONOLYSIS**

Albert (Yifan) Liu and Keith Kuwata (Advisor)

Department of Chemistry

Macalester College, St. Paul, MN

7.2 Chemistry: **SYNTHESIS AND IN-SILICO ANALYSIS OF AZO-DYE INHIBITORS OF LOW MOLECULAR WEIGHT PROTEIN TYROSINE PHOSPHATASE**

Gabriella L. Lott, Quinlen F. Marshall, Henry V. Jakubowski (Advisor), and Edward J. McIntee (Advisor)

Department of Chemistry

College of Saint Benedict - Saint John's University, St. Joseph and Collegetown, MN

7.3 Chemistry: **DEHYDRATION OF 4-HYDROXY-4-METHYLPENTAN-2-ONE USING AN ECO-FRIENDLY CATALYST**

Adam Pagnano and Heather Sklenicka (Advisor)

Department of Chemistry

Rochester Community and Technical College, Rochester, MN

7.4 Chemistry: **PHOSPHATE CONCENTRATION ANALYSIS IN MUNICIPAL DRINKING WATER RESERVOIRS**

Cynthia Wu-Yee and Heather Sklenicka (Advisor)

Department of Chemistry

Rochester Community and Technical College, Rochester, MN

7.5 Engineering: **CALIBRATING OPTICAL PARTICLE COUNTERS TO EXAMINING HYPERSONIC BOUNDARY LAYER TRANSITION THROUGH HIGH ALTITUDE BALLOONING**

Akshay Naik, Nathan Pharis, and James A. Flaten (Advisor)

Department of Aerospace Engineering and Mechanics

University of Minnesota, Minneapolis, MN

Full abstracts may be found in the
Journal of Abstracts of the
Minnesota Academy of Science
available online at **www.mnmas.org**.

Student Presentations by Last Name

Anderson, Marie	Session 1	Ronken, Jenna	Session 6
Crosson, Jessica	Session 1	Sargent, Haley	Session 4
Ertsgaard, Danielle	Session 2	Schorn, Rachel	Session 1
Gaalswyk, McKenna	Session 1	Schwanberg, Sophee	Session 3
Gidenko, Lilia	Session 3	Smuszkiewicz, Jenna	Session 6
Greenlee, Emma	Session 5	Son, Nayeon	Session 5
Host, Alex	Session 1	Sullivan, Amy	Session 6
Hrycyna, Elizabeth	Session 4	Thoreen, Justin	Session 2
Kornkven, Joan	Session 3	Van Acker, Cindy	Session 3
Liu, Albert	Session 7	Van Houten, Cole	Session 5
Lorsung, Graham	Session 4	Vernekar, Mayuresh	Session 5
Lott, Gabriella	Session 7	Waters, Mackenzie	Session 6
Luman, Kendall	Session 4	Waughtal, Nicholas	Session 5
Martinson, Savannah	Session 2	Wills, Maya	Session 4
Miller, Haley	Session 2	Wolf, Delaney	Session 2
Naik, Akshay	Session 7	Wuu-Yee, Cynthia	Session 7
Pagnano, Adam	Session 7	Yang, Andy	Session 3
Putzier, Catherine	Session 6		

Student Presentations by Category

Biochemistry: Presentations 1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3

Cellular / Molecular Biology: Presentations 1.3, 1.4, 2.4, 2.5, 3.4, 3.5, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.1, 6.2

Chemistry: Presentations 7.1, 7.2, 7.3, 7.4

Ecology & Environmental Science: Presentations 4.4, 4.5, 5.4, 5.5, 6.3, 6.4

Engineering: Presentation 7.5

Neuroscience: Presentation 1.5

Organismal & Physiological Sciences: Presentation 6.5

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Founded in 1873, the Minnesota Academy of Science (MAS) is a statewide 501(c)3 organization committed to advancing science, technology, engineering, and math (STEM) in Minnesota by connecting Minnesotans of all backgrounds with resources and opportunities to engage in STEM learning, research, and communication—and to recognize excellence in these areas.

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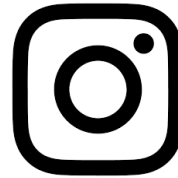
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