



**UTAH ACADEMY
of
Sciences, Arts & Letters**

Established 1908

Annual Conference

March 20, 2021

Virtual Conference

UTAH ACADEMY OF SCIENCES, ARTS, & LETTERS
Annual Conference – Saturday, March 20, 2021

10:00 a.m. – 10:05 a.m. – Rachel Keller, President
Welcome

10:05 a.m. – 10:15 a.m. – Rachel Keller, President
Academy Business

10:15 a.m. – 10:30 a.m. – Presented by Dan Poole, President Elect
Distinguished Service Award Presentation
Dr. F. Ann Millner, Utah State Senate, and former Weber State University President.
John & Olga Gardner Prize Presentation
Dr. John Mukum Mbaku, Weber State University

10:30 a.m. – 11:15 a.m.
O.C. Tanner Lecture
Dr. John Mukum Mbaku

11:15 a.m. – 12:00 p.m.
O.C. Tanner Lecture 2020 Recipient
Dr. Alan Titus

12:00 p.m. – 1:00 p.m.
Poster Sessions

1:00 p.m. – 2:30 p.m.
Division Breakout Sessions
See “Division Session Zoom Links”

3:00 p.m. – 4:00 p.m.
Division Breakout Sessions
See “Division Session Zoom Links”

4:00 p.m. – 5:00 p.m.
UASAL Board Meeting

Sessions

Zoom Links on Schedule

OPENING SESSION:

POSTER:

Session 1:

Session 2:

Session 3:

Session 4:

ARTS:

Session:

BIOLOGICAL:

Session:

BUSINESS:

Session:

EDUCATION:

Session:

ENGINEERING:

Session IA:

Session IB:

HUMANITIES, PHILOSOPHY, AND FOREIGN LANGUAGE

Session:

KINESIOLOGY AND HEALTH SCIENCES:

Session:

LETTERS, LANGUAGE, & LITERATURE:

Session IA:

Session IB:

PHYSICAL SCIENCES:

Session IA:

Session IB:

SOCIAL SCIENCES:

Session:

Spring Excursion: Cancelled due to the pandemic

Distinguished Service Award

Dr. F. Ann Millner

The Distinguished Service Award is given in recognition of exceptional service to the higher education community in Utah.

Dr. F. Ann Millner was the 11th president of Weber State University from 2002 to 2012. She was appointed to this role after 20 years of serving the university as an educator and administrator.

She is currently serving as the Majority Whip in the Utah State Senate. She has previously served as the Assistant Majority Whip in the Senate, the Chair of the Higher Education Strategic Planning Commission of the state legislature, and the Chair of the Senate Ethics Committee. As the Majority Whip in the Senate, she currently sits on ten legislative committees, including the Executive Appropriations Committee, the Senate Education Committee, the Senate Education Confirmation Committee, the Higher Education Appropriations Subcommittee, the Public Education Appropriations Subcommittee, the Legislative Management Committee, the Senate Economic Development and Workforce Services Committee, the Senate Economic Development and Workforce Services Confirmation Committee, the Senate Ethics Committee, and the Senate Transportation, Public Utilities, Energy, and Technology Committee.

She received a B.S. in Education from the University of Tennessee, an M.S. in Allied Health Education and Management from Southwest Texas State University, and an Ed.D. in Educational Administration from Brigham Young University in 1986.

She then worked in a variety of positions at educational institutions. She was Education Coordinator of the Medical Technology Program at Vanderbilt University, Instructional Developer in Medical Technology at Thomas Jefferson University, a Lecturer at the School of Health Professions, Southwest Texas State University, and Associate Director of Continuing Education at the Edmonda Campus of Gwynedd Mercy College. She began employment at Weber State College in 1982 and held such positions as Director of Outreach Education in the School of Allied Health Sciences, Assistant Vice President for Community Partnerships, Associate Dean of Continuing Education, and in 1993 she became Vice President for University Relations.

Millner has been involved in various community and academic organizations. She is the current chair of the Utah Campus Compact and a board member for Intermountain Health Care, the Ogden/Weber Chamber of Commerce, the Weber Economic Development Corporation, and Coalition for Utah's Future. She has been a member of the NCAA I-AA/I-AAA Presidential Advisory Group, the Council of State Representatives for the American Association of State Colleges and Universities, and the Ogden Rotary Club.

John & Olga Gardner Prize

Dr. John Mukum Mbaku

The Gardner Prize is awarded annually for exceptional achievement by an academic professional in Utah.

Dr. John Mukum Mbaku is a Brady Presidential Distinguished professor of economics and John S. Hinckley Fellow at Weber State University. He is also a nonresident senior fellow at the Brookings Institution in Washington, D.C., and an attorney and counselor at law, licensed to practice in the Supreme Court of the State of Utah and the U.S. District Court for the District of Utah.

He is a consultant to several domestic and international news organizations, as well as multilateral organizations (e.g., the African Development Bank), on governance issues in Africa and has appeared on several domestic and international news programs to discuss elections, corruption, and other governance-related issues in Africa. He is also a consultant to the United Nations.

He received his Ph.D. in economics from the University of Georgia and his J.D. in law and graduate certificate in natural resources and environmental law from the S. J. Quinney College of Law at the University of Utah. He is a resource person for the Kenya-based African Economic Research Consortium.

His research interests are in public choice, constitutional political economy, sustainable development, law and development, international human rights, intellectual property, rights of indigenous groups, trade integration and institutional reforms in Africa.

He is the author of *Corruption in Africa: Causes, Consequences, and Cleanups* (Lexington Books, 2010) and (with Mwangi S. Kimenyi) of *Governing the Nile River Basin: The Search for a New Legal Regime* (The Brookings Institution Press, 2015) and *Protecting Minority Rights in African Countries: A Constitutional Political Economy Approach* (Edward Elgar, 2018).

On May 22, 2017, he was admitted and qualified as an Attorney and Counsellor of the Supreme Court of the United States.

At Weber State University, he teaches courses in principles of economics, intermediate microeconomics, international trade, business calculus, and economic development. He also engages with community groups and helps them understand issues such as globalization, outsourcing, and immigration and how they affect economic activities in the United States.

O.C Tanner Lecture

“The Academy’s Role in Contemporary Society.”

John Mukum Mbaku

Throughout the world, many countries look to the United States for guidance on how to deal with at least two issues: how to develop and adopt (1) a governance system that enhances and guarantees peaceful coexistence, minimizes impunity, and significantly promotes the recognition and protection of human rights; and (2) an economic systems that advances entrepreneurship, innovation, and the creation of the wealth that can be used to alleviate poverty and improve the quality of life for all citizens. While the republican system of government that was created by the Founders in the late-18th Century has faced several challenges, it has been and remains robust and resilient enough to withstand these challenges, as well as adapt and grow. In addition, the country’s economic system has the world’s most enabling environment for entrepreneurship, innovation and the creation of knowledge and wealth. The success of both the economic and political systems in the United States has been due to its virtuous, robust and politically active public (i.e., civil society). Members of the Utah Academy of Sciences, Arts, and Letters are part of that civil society, which has served, not only as a check on the exercise of government power, but as a major contributor to the creation of conditions in Utah and the nation that advance critical objectives, such as, the protection of human rights, peaceful coexistence, eradication of poverty, prevention and treatment of disease, promotion of civility, creation of knowledge to minimize human suffering, maintenance of values (e.g., hard work, fidelity to the rule of law, respect for one another), and the cultivation and sustenance of ethical forms of conduct. Knowledge created by Members of the Academy adds value to our lives and makes this world a better place to live.

***O.C. Tanner Lecture 2020 Recipient**

“In the Land of Rainbows and Unicorns: Forensic Science of a 76-million-year-old Tyrannosaur Mass Mortality”

Dr. Alan L. Titus

Tyrannosaurids, including the mega-celebrity *Tyrannosaurus rex*, one of the largest terrestrial carnivores of all time, dominated the Northern Hemisphere during the Late Cretaceous (66-100 Ma). Rare tyrannosaur mass mortality sites in both east Asia and North America have been used as arguments that they were social animals, possibly grouped into cooperative packs. Site 14UTKA-8, inside Grand Staircase-Escalante N.M., also known as the Rainbows and Unicorns Quarry, has yielded the remains of at least four individuals of the advanced tyrannosaurine *Teratophoneus curriei* buried in close proximity. Examination of the geological, faunal, stable isotope, taphonomic, and charcoal evidence at the site appears to confirm the tyrannosaurs died as a group in a catastrophic single event, rather than through some attritional process like a predator trap. As a result, some level of social behavior can be inferred for *T. curriei*, a species much more closely related to *T.-rex* than any from previously documented sites.

Journal of the Utah Academy Publication Policy

The Journal of the Utah Academy of Sciences, Arts, and Letters publishes works in all of the fields of study encompassed in the Academy's mission. Papers published in The Journal of the Utah Academy of Sciences, Arts, and Letters are drawn from papers presented by members in good standing at the annual conference of the Utah Academy. The Journal of the Utah Academy is a refereed journal. To qualify for publication, the papers must be recommended through a refereeing system.

Presenters are encouraged to publish their paper in The Journal of the Utah Academy. The Journal's criteria are that a submission is (1) fresh, meaningful scholarly insight on its subject; (2) readable and well written; and (3) of general interest for an academic readership beyond the author's field.

If you wish your paper to be considered for publication in The Journal, please submit a Microsoft Word document to the chair of the appropriate division by June 1st, 2020. Contact information for division chairs is available on the Utah Academy's website (www.utahacademy.org). Editorial responses will be forthcoming after the resumption of school the following fall when referees have returned their comments to the division chairs.

Papers should be between ten and twenty double-spaced pages. Detailed instructions to authors are available at <http://www.utahacademy.org/>.

Poster Presentation Divisions

Poster Session

Division Chair: Jacque Westover
Utah Valley University

SESSION 1

Session Leader: Jacque Westover

- 12:00 p.m. Title: Possible Thermal and Respiratory Constraints for Fleas (Siphonaptera: *Ceratophyllidae*) on North American Deer Mice (Mammalia: Rodentia)
Presenter: Robert L. Bossard
Author: Robert L. Bossard
Affiliation: Bossard Consulting
- 12:10 p.m. Title: Assessing the Role of Prescribed Painkillers and its Impact on the Opioid Epidemic
Presenter: Abel Reed
Authors: Abel Reed, Dr. Vinod Chellamuthu
Affiliation: Dixie State University
- 12:20 p.m. Title: Is Thinness Truly Next To Godliness? Examining Moral Judgements Against Women With Larger Bodies in a Latter-day Saint Population
Presenter: Sydney Rasmussen
Author: Sydney Rasmussen
Affiliation: Brigham Young University
- 12:30 p.m. Title: Parental Religiosity and the Coming Out Process
Presenter: Gabrielle Svozil
Author: Gabrielle Svozil
Affiliation: Brigham Young University

SESSION 2

Session Leader: Daniel Clark

- 12:00 p.m. Title: Investigating the Presence of *Streptomyces* in Utah Insects
Presenter: Sarah Wilcox
Author: Sarah Wilcox and Nathaniel Cannon
Affiliation: Southern Utah University
- 12:10 p.m. Title: Exploring the Role of Lipid Metabolism in Hepatocellular Carcinoma
Presenter: Noelle Reimers
Author: Noelle Reimers and Greg Ducker
Affiliation: University of Utah
- 12:20 p.m. Title: Combination phage-antibiotic therapy on MRSA in broth and biofilms
Presenter: Adam E. Jordan
Author: Adam E. Jordan, Caleb R. Harrop, Zackary A. Pedersen, Heather L. Sheehan, Michael Otterstrom, Usama Barnawi, Jacob J. Bullough, Daniel N. Clark
Affiliation: Weber State University

12:30 p.m. Title: CRISPR Deletion of Viral Receptor Genes in Human Cells
Presenter: Nicole Skalka
Author: Nicole Skalka, Megan Conroy, Jonathan Spencer, Jareth Aranda, Taylor Demler, Robert Ludlow, Corbin DeSanti, Hunter Branch, Saiman Sadiq, Daniel N Clark
Affiliation: Weber State University

SESSION 3

Session Leader: Chris Monson

12:00 p.m. *Title: Predicting the presence of *Juniperus osteosperma* using niche modeling techniques at the Three Peaks Recreational Area
Presenter: Justin D. Mickelson
Author: Justin D. Mickelson, Rachel T. Bolus, R. Matthew Ogburn
Affiliation: Southern Utah University

12:10 p.m. Title: Undergraduate Student Research Conducting DNA Extraction, sequencing and assessing quality from Angiosperm and Gymnosperm Herbarium Specimens.
Presenter: Ethan M. Rosati
Author: Ethan M. Rosati
Affiliation: Utah Valley University

12:20 p.m. Title: Old World *Vigna (Fabaceae)* Phylogenetic Analysis
Presenter: Dasha Horton
Author: Dasha Horton and Ashley N. Egan
Affiliation: Utah Valley University

12:30 p.m. Title: Extraction of Soil Phage Against Local Wild Rhizobia
Presenter: Krey Ramsey
Author: Krey Ramsey, Matthew Crook, Matthew Domek
Affiliation: Weber State University

12:40 p.m. Title: Selective Media for the Isolation of *Paucilactobacillus wasatchensis*
Presenter: R. Chase Wahlstrom
Author: R. Chase Wahlstrom, Craig Oberg, Matthew Domek
Affiliation: Weber State University

SESSION 4

Session Leader: Jonathan Westover

12:00 p.m. Title: Plasma Spectroscopy as Applied to Astrophysical Observations
Presenter: Rebecca J. Nelson
Authors: Rebecca J. Nelson and Dr. Theodore Lane
Affiliation: Southern Utah University

12:10 p.m. Title: Tissue Phantom Study to Characterize Detection of Cancer Cells with Raman Spectroscopy
Presenters: Priscilla Lagunas, Haidy Rivera
Authors: Priscilla Lagunas, Haidy Rivera, Jordyn Hales, Jessica Jones, Dustin Shipp
Affiliation: Utah Valley University

- 12:20 p.m. Title: An Exploration of a Novel Synthesis for Merocyanines
Presenter: Jacob Newey
Authors: Jacob Newey, Kyler White
Affiliation: Southern Utah University
- 12:30 p.m. Title: Synthesis and Characterization of Locked Dipyrroles for Insight into Energy Transfer in Biological Systems
Presenter: Shardon T. Morrill
Authors: Shardon T. Morrill, Mackay B. Steffensen
Affiliation: Southern Utah University

Oral Presentation Divisions

Arts

Division Chair: Angela Banchemo-Kelleher
Utah Valley University

SESSION

Session Leader: Angela Banchemo-Kelleher

- 1:00 p.m. *Title: From Dancing in the Desert to *Dancing with the Stars*: Contributions of Latter-day Saint Culture to Dance in Utah
Presenter: Diana Brewster, Miranda Fife, McCall McClellan
Authors: Diana Brewster, Miranda Fife, McCall McClellan
Affiliation: Brigham Young University
- 1:15 p.m. Title: Rota Fortuna: Divining the Future of Viewership & Arts Consumption
Presenter: Courtney R. Davis
Author: Courtney R. Davis
Affiliation: Utah Valley University
- 1:30 p.m. Title: Why We Adapt Tragedy: Parallels between the Orpheus Myth and Frankenstein Films (1931/1935)
Presenter: Madison Sheldrake
Author: Madison Sheldrake
Affiliation: Brigham Young University
- 1:45 p.m. *Title: Ballet and Bonaparte
Presenter: Golda Dopp Ovalles
Author: Golda Dopp Ovalles
Affiliation: Utah Valley University
- 2:00 p.m. *Title: Healing Trauma in the Art Classroom
Presenter: Audrey Reeves
Author: Audrey Reeves
Affiliation: Utah Valley University
- 2:30 p.m. Break
- 3:00 p.m. Title: Navigating Trauma While Seeking Connection and Community Through Dance During COVID-19
Presenters: LeGrande Lolo, Francesca DeMartino, Jessica Ketchum-Lee

Affiliation: Utah Valley University

3:40 p.m. Title: The Pierian Spring
Presenter: Nicholas Jolley-Harding
Affiliation: Utah Valley University

Biological Sciences

Division Chair: Daniel Clark
Weber State University

SESSION

Session Leader: Daniel Clark

1:00 p.m. Title: Using a Virus Model System to Determine the Effect of Ozone in Locker Room Sanitation
Presenter: Niharika Mishra
Authors: Justin Coles, Clark Madsen, Craig Steiner, Caleb Nyone, Josh Hansen, Berkley Scharmann, Stephen Scharmann, Niharika Mishra, Craig Oberg
Affiliation: Weber State University and McKay Dee Family Medicine Residency

1:15 p.m. *Title: An examination of ITS1 secondary structural motifs in specimens of the genus *Equisetum*
Presenter: William D. Speer
Author: William D. Speer
Affiliation: Salt Lake Community College

1:30 p.m. Title: Antimicrobial Metabolites of *Latilactobacillus curvatus*
Presenter: Dallin Leatham
Authors: Dallin Leatham, Taylor Oberg, Robert Ward, Craig Oberg
Affiliation: Weber State University, Utah State University

1:45 p.m. Title: Drug and complement inhibition of the brain-eating amoeba *Naegleria fowleri*
Presenter: Joshua O. Gee
Authors: Joshua O. Gee, Tallon Nielsen, Daniel N. Clark
Affiliation: Weber State University

2:00 p.m. Title: Analysis of Educational Outcomes in Human Anatomy Labs During the COVID-19 Pandemic: How Histology Grades Varied Among Students in Different Lab Settings (Face-to-Face Versus Remote-Synchronous Online Delivery)
Presenter: Brayden Koch, Mary Jo Tufte
Authors: Brayden Koch and Mary Jo Tufte
Affiliation: Southern Utah University

2:15 p.m. Title: Effect of Inorganic Salts on the Growth of Probiotic Lactic Acid Bacteria
Presenter: Niharika Mishra
Authors: Niharika Mishra, Craig Oberg, Michele Culumber
Affiliation: Weber State University

2:30 p.m. Title: Burn Scar: An Assessment of a Course-Based Undergraduate Research

Experience on the Effects of the Brian Head Wildfire

Presenter: Sheridan Lloyd

Authors: Sheridan Lloyd and Carrie J. Bucklin

Affiliation: Southern Utah University

- 2:45 p.m. Title: *Paucilactobacillus wasatchsensis* WCD04 biofilm formation and adherence to stainless steel
Presenter: Lizell A. Mejias
Authors: Lizell A. Mejias, Michele C. Culumber, Craig J. Oberg
Affiliation: Weber State University

Business

Division Chair: Taowen Le
Weber State University

SESSION

Session Leader: Taowen Le

- 1:00 p.m. Welcome & Introduction
- 1:20 p.m. Title: A Descriptive Analysis of Cross-National Differences in Job Satisfaction by Gender
Presenter: Maureen Andrade, Jonathan Westover, Angela Schill, Jacque Westover, Cambree King
Authors: Maureen Andrade, Jonathan Westover, Angela Schill, Jacque Westover, Cambree King
Affiliation: Utah Valley University
- 1:40 p.m. Title: Does Charter Growth Wreck District Schools, or Does Competition Lift All Boats? Trends in School Proficiency among Public Schools in Utah
Presenter: Michael Mamo
Author: Michael Mamo
Affiliation: Westminster College
- 2:00 p.m. Title: Self Efficacy, Emotional Intelligence, Self Determination and Learning Strategy: Student Survey Results and Relationship to Practice CPA Exam Scores in an Auditing Course
Presenter: Jeff Davis
Author: Jeff Davis
Affiliation: Weber State University
- 2:20 p.m. Title: The Disparity in Understanding Governmental Policy and Healthcare Economics, from Premedical Students to Physicians
Presenter: Pierce Bassett
Author: Pierce Bassett
Affiliation: Brigham Young University
- 2:40 p.m. Title: Business Ethics Education in Utah: How are we teaching ethics and why?
Presenter: Chelsea Dye, Dara Hoffa, Chari Farr
Author: Chelsea Dye, Chari Farr, Dara Hoffa, Ron Mano
Affiliation: Westminster College

Education

Division Chair Nicole Gearing
Utah Valley University

SESSION

Session Leader: Nicole Gearing

- 1:00 p.m. Title: Competency-Based Education: Opportunities and Possibilities
Presenter: Anthony Beal
Author: Anthony Beal
Affiliation: Snow College
- 1:20 p.m. Title: The Journey Through Higher Education: The Role of Mentors in Student Veteran Educational Experiences
Presenter: David Brian Kartchner
Author: David Brian Kartchner, Kristin A. Searle
Affiliation: Utah State University
- 1:40 p.m. Title: Developing Student-Teacher Relationships through Integrated STEM Curricula
Presenter: Kristin A. Searle
Author: Kristin A. Searle, Colby Tofel-Grehl, Andrea Hawkman, Beth MacDonald, Mario Suarez
Affiliation: Utah State University
- 2:00 p.m. *Title: Creating a Successful Secondary Dance Education Program
Presenter: Nichole Ortega
Author: Nichole Ortega
Affiliation: Utah Valley University
- 2:30 p.m. Break
- 3:00 p.m. *Title: Greater Rudeness: Interruptive Behavior in the Graduate School Classroom
Presenter: Thomas Terry
Author: Thomas Terry
Affiliation: Utah State University
- 3:20 p.m. *Title: Tracking Professional Development through the Creation of Culturally-appropriate Educational Materials
Presenter: David R. Byrd
Author: David R. Byrd, DeeDee Mower, Penãe Stewart, Rich Fry, & Nadia Wrosch
Affiliation: Weber State University
- 3:40 p.m. Title: Improving Self-Determination for High Students with Disabilities: ActNow
Presenter: Shirley Dawson
Author: Shirley Dawson
Affiliation: Weber State University

Engineering

Division Chair: Ali Siahpush

Southern Utah University

SESSION IA

Session Leader: Ali S. Siahpush

- 1:00 p.m. Title: Lumped Capacitance Method Analytical and Experimental Evaluation
Presenter: Collin Cutler
Author: Kyler Reinhold, Owen Telford, Collin Cutler
Affiliation: Southern Utah University
- 1:15 p.m. Title: Effectiveness of Plane Wall Radiation Shielding
Presenter: Cierra Salcido
Author: Cierra Salcido, Collin Cutler
Affiliation: Southern Utah University
- 1:30 p.m. Title: Cost Effective Solar Water Heater
Presenter: Kyler A. Reinhold
Author: Aaron J.G. Dockins, Noah A. Mollner, Kyler A. Reinhold, Omar R. Campos
Affiliation: Southern Utah University
- 1:45 p.m. Title: Direct Evaporative Cooling - Simple Analysis
Presenter: Matt Bennion
Author: Matt Bennion, Skyler Ipsen, Colby Thorton, Andrew Logan, Austin Banks
Affiliation: Southern Utah University
- 2:00 p.m. Title: Analysis of Electrical Resistivity and Conductivity of Materials
Presenter: Noah Swenson
Author: Noah Swenson
Affiliation: Southern Utah University
- 2:15 p.m. Title: Calibration and Testing of Budget Extensometer to Accurately Evaluate the Modulus of Elasticity of Steel Wire
Presenter: Owen Telford
Author: Owen Telford, Alicyn Astle, Collin Cutler, Cameron Pepi
Affiliation: Southern Utah University
- 2:30 p.m. Break
- 3:00 p.m. Title: Semi-Translucent Concrete
Presenter: Tanya Jones, Matthew Bayreder, Mako Bennett
Author: Tanya Jones, Matthew Bayreder, Mako Bennett
Affiliation: Southern Utah University
- 3:15 p.m. Title: Heat Transfer Analysis of Eicosane During Melting
Presenter: Sabrina Kim
Author: Sabrina Kim, Bill Maxwell
Affiliation: Southern Utah University

SESSION IB

Session Leader: Dr. Mohamed Askar

- 1:00 p.m. Abstract: Controller Design Using Laguerre Basis Functions
Presenter: Philip Olivier
Author: Philip Olivier
Affiliation: Engineering Analysis and Design
- 1:15 p.m. Title: Construction Key Performance Indicators Initial Reactions to the COVID-19 Pandemic, A Case Study on Design-Build Project
Presenter: Bryant Ward
Author: Xinzi Cui, Qingyang Chen, Mohamed Askar
Affiliation: Southern Utah University
- 1:30 p.m. Title: Effect of COVID-19 on Risk Management of Construction Projects - A Case Study on High-Rise Building in China
Presenter: Christian Gray
Author: Hongyu Hu, Mycrae Tebbs, Mohamed Askar
Affiliation: Southern Utah University
- 1:45 p.m. Title: Construction Safety Plans Initial Reactions and Responses to the COVID-19 Pandemic - A Case Study on Commercial Project
Presenter: Jincan Huang
Author: Olive Musimbi, Hang Chu, Mohamed Askar
Affiliation: Southern Utah University
- 2:00 p.m. Title: Delay Challenges in the USA Construction Projects due to COVID-19, A Case Study on Commercial Project
Presenter: Nicholas Harvey
Author: Yufan Xiong, Zimei Zhang, Mohamed Askar
Affiliation: Southern Utah University
- 2:15 p.m. Title: The Impact of COVID-19 on Construction Project Financial Management - A Case Study on Heavy Civil Construction Project
Presenter: Yikang Li
Author: Xin Wan, Mohamed Askar, Jared Baker
Affiliation: Southern Utah University
- 2:30 p.m. Break
- 3:00 p.m. Title: Developing a Quantitative Quality Control System to Overcome the Impact of COVID-19 on the Construction Projects in the USA. A Case Study on Commercial Project
Presenter: Yuheng Yuan
Author: Xingqi Yu, Mohamed Askar, Jared Baker
Affiliation: Southern Utah University
- 3:15 p.m. Title: Applying Binary Phase-Shift Keying to an open environment antenna pattern range
Presenter: Cade Moody
Author: Cade A. Moody and Justin B. Jackson
Affiliation: Weber State University
- 3:30 p.m. Title: Fully Printed Solar Cells Design Project

Presenter: Daniel Philpot
Author: Daniel Philpot, Justin B. Jackson
Affiliation: Weber State University

Humanities, Philosophy, and Foreign Language

Division Chair: Craig Bergeson
Weber State University

SESSION

Session Leader: Craig Bergeson

- 1:00 p.m. Title: The Overlooked Diderot
Presenter: Zahran Austin
Author: Zahran Austin
Affiliation: Weber State University
- 1:20 p.m. Title: Bartleby, the Hypothetical
Presenter: Brady Earley
Author: Brady Earley
Affiliation: Brigham Young University
- 1:40 p.m. Title: “Something large and old awoke: Eco-poetics and Compassion in Tracy K. Smith’s Wade in the Water”
Presenter: Kaitlin Hoelzer
Author: Kaitlin Hoelzer
Affiliation: Brigham Young University
- 2:00 p.m. Title: Recreating the Anastasis in 3D
Presenter: Bob deWitt
Author: Bob deWitt
Affiliation: Utah Valley University

Letters, Language, & Literature

Division Chair: Keith Lawrence
Brigham Young University

SESSION 1A (1:00 to 2:30)

Creative Writers I—Putting It on the Page: Grief and Loss through Fiction
Session Leader: Lisa Christensen

- 1:00 p.m. Title: “Death Kindly Stopped”
Author: Chanel Earl
Affiliation: Brigham Young University
- 1:15 p.m. Title: “Cheating”
Author: Dallin Hunt
Affiliation: Brigham Young University
- 1:30 p.m. Title: “Outed”
Author: Madalyn McRae
Affiliation: Brigham Young University

1:45 p.m. Title: “Eye of the Private Storm”
Author: Lisa Christensen
Affiliation: Brigham Young University

2:00 p.m. Discussion

2:30 p.m. Break

SESSION 1B (2:45 – 4:00)

Creative Writers II—*Nuclear Bombs, Love Letters, and Grandmothers: Beauty is Truth

Session Leader: Thew Curtis

2:45 p.m. Title: “Nuclear Folly”
Author: Carma Hilland
Affiliation: Brigham Young University

3:00 p.m. Title: “She Takes After Her Grandma”
Author: Kalli Abbott
Affiliation: Brigham Young University

3:15 p.m. Title: Dear Isa (selections)
Author: Thew Curtis
Affiliation: Brigham Young University

3:30 p.m. Discussion

Physical Sciences

Division Chair: Chris Monson
Southern Utah University

SESSION IA: Chemistry

Session Leader: Chris Monson

1:00 p.m. Title: 3D-Printable Cell Phone Spectrophotometer for Chemistry Education
Presenter: Brittany Christensen
Authors: Brittany Christensen, Chris Monson
Affiliation: Southern Utah University

1:20 p.m. Title: Inverse frit semipermeable PDMS membranes
Presenter: Mikey Savage
Authors: Mikey Savage, Aubriel Koehler, Megan Jensen, and Christopher Monson
Affiliation: Southern Utah University

1:40 p.m. Title: Using Silver Nanoparticles to Detect Early Onset of Disease
Presenter: Porter Wilkes, Payton Riggs, Jonah Babbel
Authors: Porter Wilkes, Payton Riggs, Jonah Babbel, Christopher Monson
Affiliation: Southern Utah University

2:00 p.m. Title: Home Made Raman Spectrometer
Presenter: Hamza Samha
Authors: Hamza Samha, Dr. Mathew Rowley

Affiliation: Southern Utah University

- 2:30 p.m. Break
- 3:00 p.m. Title: Changing the paradigm on Copper Nanoparticle formation
Presenter: Jessie Fischer
Authors: Jessie Fischer, Tanner Stenlund, Christopher Monson
Affiliation: Southern Utah University
- 3:20 p.m. Title: Biomolecular separation via microfluidic devices
Presenter: Payden Harrah
Authors: Payden Harrah, Christopher F. Monson
Affiliation: Southern Utah University

SESSION IB: Physics, Math and Earth Sciences

Session Leader: Theodore Lane

- 1:00 p.m. Title: Possible Synapsid Tracks from the Lower Jurassic Moenave Formation, Southwestern Utah
Presenter: Holly Hurtado
Authors: Holly Hurtado, Jerald D. Harris, Andrew R.C. Milner
Affiliation: Dixie State University
- 1:20 p.m. Title: Evaluation of Super Fund Removal Action at the King Edward Mine
Presenter: Robert Davidson
Authors: Robert Davidson, Andreas Lippert, Charles Davidson, Tori Schaffer, Dale Harber
Affiliation: Weber State University
- 1:40 p.m. Title: Investigating Mutual Inductance Coefficients using Theta Pinches
Presenter: Shaun Cluff
Authors: Thayne Hansen, Shaun Cluff, Theodore Lane
Affiliation: Southern Utah University
- 2:00 p.m. Title: Rocketing ahead with fusion?
Presenter: Christopher Hooper
Authors: Christopher Hooper, Phil Matheson
Affiliation: Utah Valley University
- 2:30 p.m. Title: The Fractal Dimension of Product Sets
Presenter: Clayton Williams
Authors: Clayton Williams, Machiel van Frankenhuijsen
Affiliation: Brigham Young University, Utah Valley University

Social Sciences

Division Chair: Emily Putnam
Salt Lake Community College

SESSION

Session Leader: Emily Putnam

- 1:00 p.m. Title: Politics, Religion, and Values as Predictors of Support for Sexual Assault

Reporting and #MeToo: A National Sample in the United States

Presenter: R.C. Morris

Authors: R.C. Morris

Affiliation: Weber State University

- 1:15 p.m. *Title: Ripple in Still Water: Psychedelic Rock Resistance
Presenter: Theresa Martinez
Author: Theresa Martinez
Affiliation: University of Utah
- 1:30 p.m. Title: A Summary of the Science of Play in Early Childhood
Presenter: Reetta Saaski
Authors: Reetta Saaski, Abbi Covington, Sarah Prince, Michael J. Guynn, Dannelle Larsen-Rife
Affiliation: Dixie State University
- 1:45 p.m. Title: From Mormon to “None”: Dynamics of Latter-day Saint Religious Disaffiliation in Utah
Presenter: Rick Phillips
Author: Rick Phillips
Affiliation: University of North Florida
- 2:00 p.m. Title: Silicon Visions: Regional Entrepreneurialism and the Technology Economy in Utah’s Silicon Slopes
Presenter: Jeremy Bryson
Authors: Jeremy Bryson, Melissa Jensen
Affiliation: Weber State University
- 2:15 p.m. Title: A Nuclear Crisis in East Asia: China, Taiwan, and the United States
Presenter: Sasha Woffinden
Author: Sasha Woffinden
Affiliation: Brigham Young University
- 2:30 p.m. Q & A/Discussion
- 2:45 p.m. Break
- 3:00 p.m. *Title: Leadership: A Protean Institution of the Mind and of Civilization
Presenter: Pierce Bassett
Author: Pierce Bassett
Affiliation: Brigham Young University
- 3:15 p.m. *Title: Housing and Autism Spectrum Disorder: Insights from Individuals and Families
Presenter: Jonathan Westover
Authors: Jonathan Westover, Maren Paulsen, Kari Bushman, Teresa Cardon
Affiliation: Utah Valley University
- 3:30 p.m. Title: Behind the Wall: Climate Change, Global Security, and Border Militarization
Presenter: Aidan Reed
Author: Aidan Reed
Affiliation: Southern Utah University

3:45 p.m. Title: Forgive Me Father For My Children Have Sinned: Religiosity, Intrusive Parenting, and Attachment Styles
Presenter: Michael J. Guynn
Authors: Michael J. Guynn, Sarah Prince, Abbi Covington, & Dannelle Larsen-Rife
Affiliation: Dixie State University & University of Minnesota

4:00 p.m. Conclude

POSTER ABSTRACTS

BIOLOGY POSTERS

Title: Possible Thermal and Respiratory Constraints for Fleas (Siphonaptera: Ceratophyllidae) on North American Deer Mice (Mammalia: Rodentia)

Author: Robert L. Bossard

Affiliation: Bossard Consulting

Abstract: There are numerous examples of terrestrialization and diversification of ceratophyllid fleas in North America. The flea genus *Aetheca* is confined to western North America and its two species appear currently allopatric. *Aetheca thamba* is at high elevations in the U.S. Rocky Mountains, and lower elevations in Canada, but *Aetheca wagneri* is at lower elevations in the western U.S. Parapatric thermal speciation may have occurred since the last Ice Age, because deer-mice hosts (*Peromyscus* spp.) are abundant throughout these fleas' ranges. Thermal speciation and thermal niches are reported in the ocean and the terrestrial tropics for diverse phyla. In addition to direct effects of temperature on the growth of larval fleas, correlated processes such as respiration may constrain flea occurrence. The flea *Orchopeas leucopus* co-occurs with *A. wagneri* in the Great Basin Desert, often infesting the same individual mouse. However, *O. leucopus* appears constrained to cool moist times of the year, but with a widespread distribution in eastern North America, unlike *A. wagneri*, which occurs throughout the year but only in western North America. The contrasting geography and seasonality of *O. leucopus* and *A. wagneri* may be partly a result of thermal and respiratory constraints peculiar to their respective phylogenies. The importance of competition in mediating abiotic factors among flea larvae or among flea adults is unclear. *Aetheca* and *Orchopeas* are both *Ceratophyllidae*, a new flea family possibly originating in the Himalaya Mountains, which radiated explosively all through the Holarctic region, by colonizing new hosts in extreme environments by using unknown adaptations. Flea respiratory systems are exceedingly diverse, dynamic, and phylogenetically conserved, but have not been linked clearly to species habitat or seasonality. Fleas on deer-mice are an exciting community for understanding physiological ecology.

Title: Investigating the Presence of *Streptomyces* Streptomycin in Utah Insects

Authors: Sarah Wilcox and Nathaniel Cannon

Affiliation: Southern Utah University

Abstract: Antibiotic resistance is one of the biggest threats to healthcare occurring around the world. The naturally occurring bacteria, *Streptomyces*, is the source for many commonly used antibiotics. Antibiotic resistance can be fought with the development of alternative antibiotics created from any newly discovered strains of *Streptomyces*. New compounds of *Streptomyces* are rarely discovered when searched for in common locations (such as soil or plants), but new research has found *Streptomyces* in unusual places. According to a 2019 study, insects have been discovered as vessels carrying new compounds of *Streptomyces* that potentially can be an original source of antibiotic material (Chevrette et al., 2019). This new research tested insects from all around the United States, but no samples were collected in Utah. I will be testing for the presence of *Streptomyces* in insects collected from three different Southern Utah sampling locations: Woods Ranch, Cedar City's Veteran's Park, and St. George's Red Hills Desert Garden. My research will focus on the common insects collected at each location including grasshoppers (Orthoptera) and bees, wasps, and ants (Hymenoptera). This experiment's procedures include DNA extraction, DNA sequencing, determining which bacterial primers result in optimal PCR results, and gel electrophoresis to analyze bacterial presence. I hypothesize that

Streptomyces will be present in at least one of my collected insect samples. The discovery of new forms of *Streptomyces* can lead to the formation of new antibiotics that can be used to fight against the increasingly dangerous phenomenon of antibiotic resistance.

Title: Exploring the Role of Lipid Metabolism in Hepatocellular Carcinoma

Authors: Noelle Reimers, Greg Ducker

Affiliation: University of Utah

Abstract: Hepatocellular carcinoma (HCC) is an aggressive cancer with poor survival rates and limited treatment options whose prevalence is expected to increase up to 137% by 2030. Existing therapies outside of liver resection or transplantation have poor efficacy, and few new treatment options have been developed in recent decades. It is now known that the lipid metabolism of HCC cells is significantly altered relative to normal liver cells, often involving upregulation of fatty acid synthesis and oxidation enzymes. These lipid metabolic enzymes could represent a class of novel therapeutic targets for the treatment of HCC. To investigate this possibility, we designed a targeted library of existing lipid metabolic drugs for a repurposing screen. We treated a liver cancer cell line with 187 lipid metabolic drugs and clinical compounds in order to determine their relative anti-proliferative effects and therapeutic potential. The initial screening on Huh7 liver cancer cells identified 24 compounds of interest based on a dose dependent anti-proliferative response. The hits largely came from drugs targeting phospholipase, cytochrome P450, FAAH, and autophagy enzymes. We are continuing screening in 2 additional liver cell lines and following up on compounds identified as hits using a dose response assay. In the future, we hope to further elucidate the metabolic effects of the drugs by using mass spectrometry to identify specific lipid metabolites in treated cells.

Title: Combination phage-antibiotic therapy on MRSA in broth and biofilms

Authors: Adam E. Jordan, Caleb R. Harrop, Zackary A. Pedersen, Heather L. Sheehan, Michael Otterstrom, Usama Barnawi, Jacob J. Bullough, Daniel N. Clark

Affiliation: Weber State University

Abstract: Due to continued issues regarding the resistance of *Staphylococcus aureus* (*S. aureus*) to common therapeutic antibiotics, the need to establish supplementary or complementary treatment options is paramount. Indeed, the well known methicillin-resistant *S. aureus* (MRSA) can destroy beta-lactam antibiotics, is difficult to treat, grows in biofilms, and can lead to fatal infections. Although there are many ways to kill bacteria, very few may be used as a treatment for health care purposes. One such method to inhibit bacterial growth and destroy sticky biofilm layers is the use of bacteriophage or "phage", a virus that infects bacteria but not human cells. We employed phage K, which causes lytic infections in MRSA bacteria. Phage K was used in combination with the beta-lactam antibiotic carbenicillin (to which MRSA is resistant) and the common MRSA antibiotic vancomycin (to which MRSA is sensitive). After testing the minimum inhibitory concentrations required to kill MRSA, we used sub-lethal doses of antibiotics combined with phage K. It was found that bacteriophages were better able to clear MRSA compared to antibiotics alone. The effect due to phage K killing was estimated by measuring phage DNA levels with RT-PCR. Both MRSA broth cultures and MRSA biofilms grown on glass and plastic surfaces were tested. It is hoped that the combination therapy of phage with antibiotics may prove to break down biofilms and prevent resistant strain survival in hospital settings, thus preventing devastating MRSA infections.

Title: CRISPR Deletion of Viral Receptor Genes in Human Cells

Authors: Nicole Skalka, Megan Conroy, Jonathan Spencer, Jareth Aranda, Taylor Demler, Robert Ludlow, Corbin DeSanti, Hunter Branch, Saiman Sadiq, Daniel N Clark

Affiliation: Weber State University

Abstract: Enterovirus 71 (EV71) and herpes simplex 1 (HSV-1) are viruses that cause skin lesions in humans. EV71 is a virus that causes hand foot and mouth disease (HFMD) and primarily affects young children. In recent outbreaks in Asia, however, there have been reports of more serious and life-threatening brain infections. HSV-1 is a lifelong infection, causing genital herpes and cold sores, which affects 50 to 80 percent of US adults. In this experiment, we use CRISPR to edit the human genome in cultured cells (HEK293 and HeLa) to decrease the infectivity of these two viruses by deleting their receptors. To delete these receptor genes, a guide RNA (gRNA) was designed for each receptor using the Broad Institute gRNA design tool (ANXA2, SCARB2, and SELPLG for EV71, and Nectin-1 and HVEM

for HSV-1). Plasmids that express each gRNA and the CRISPR cutting enzyme, Cas9, were transfected into human cells using the base plasmid All in one CRISPR. This plasmid contains a dsRed fluorescent protein and a hygromycin selectable marker for selection of edited cells. Plaque assays then compare infectivity in parent cells versus receptor-deleted cells. Because viruses use combinations of receptors, the end goal is to determine which receptors are most critical for attachment and entry into cells in order to target those receptors for virus inhibition.

***Title:** Predicting the presence of *Juniperus osteosperma* using niche modeling techniques at the Three Peaks Recreational Area

Authors: Justin D. Mickelson, Rachel T. Bolus, R. Matthew Ogburn

Affiliation: Southern Utah University

Abstract: We conducted a study in the Three Peaks Recreational Area using niche modeling techniques to predict the presence of *Juniperus osteosperma* in the area. 506 plots (132 containing *Juniperus osteosperma*) with radii of 3 meters were sampled. Plots were tested for soil composition, and evidence of plants and animals. Sampled plots were analyzed with R and MaxEnt. An analysis of the plots found that the most important factors, both biotic and abiotic, in determining the presence or absence of *Juniperus osteosperma* was the presence of a rocky terrain, total plant count, total plant species, habitat type, and soil type. In plots that the soil was not rocky, and the plant count was less than 31.5, juniper was absent in 82% of the 274 plots. The model was weakly predictive of the presence of juniper (CCR = 0.74, Kappa = 0.43, n = 506, p < 0.01). More research may be done by using these variables to predict the possible migration of *Juniperus osteosperma* into new ecosystems as local climates change. It is anticipated that this project will continue by sampling the plots again to obtain more consistent data collection methods and accuracy, in addition to analyzing more focal species from the sampled areas.

Title: Undergraduate Student Research Conducting DNA Extraction, sequencing and assessing quality from Angiosperm and Gymnosperm Herbarium Specimens.

Author: Ethan M Rosati

Affiliation: Utah Valley University

Abstract: The three goals in this investigation were, one, assessing DNA quality; two, submitting DNA sequences to global barcoding initiatives; and three, lay the groundwork for future engaged learning opportunities. I compared angiosperm and gymnosperm extraction quality and quantity from exsiccate herbarium specimens. The DNA sequences collected will create a reference collection building a valuable student resource for future phylogenetic work. DNA was collected by way of a destructive method of grinding. After material collection, DNA extraction kits were used. I amplified the DNA via PCR then observed the quality and quantity of the PCR products through gel electrophoresis and nanodrop. To investigate success in amplification of the target DNA sequence the ITS region was sequenced (Cheng, 2016). Ultimately, the goal is to add our sequenced data to the barcoding body of knowledge to help biologists have intellectual control, conserve, and protect the biota of Utah and the world.

Title: Old World *Vigna* (Fabaceae) Phylogenetic Analysis

Authors: Dasha Horton, Ashley N. Egan

Affiliation: Utah Valley University

Abstract: The genus *Vigna* includes a number of economically important crop species that provide a significant proportion of the world's plant-based protein. A solid understanding of the evolutionary relationships and taxonomic classification are important to provide contextual understanding of this plant group and relations of crop species to wild relatives. However, the taxonomic classification and circumscription of this genus has had a turbulent past and has not addressed the group holistically. Here, we incorporate an improved taxonomic sampling from African and Old World *Vigna* species with previously sampled New World taxa to provide a more comprehensive estimate of evolutionary relationships using molecular phylogenetic analysis. We interpret the results in terms of wild relatives of crop species and in the context of previous botanical classification schemes.

Title: Extraction of Soil Phage Against Local Wild Rhizobia

Authors: Krey Ramsey, Matthew Crook, Matthew Domek

Affiliation: Weber State University

Abstract: Viruses are among the smallest and least complex biological agents on earth, and yet they have a profound impact on all domains of life. The viruses which specifically infect bacteria, known as bacteriophage or phage, have proven to be useful genetic, ecological, and research tools for understanding and manipulating specific species and strains of bacteria. Rhizobia are a group of nitrogen-fixing bacteria which form a symbiotic relationship with certain species of legume, such as clover and alfalfa. These bacteria induce the plant host to form special organs on their roots, called nodules. The rhizobia inhabit the root nodules, where they convert atmospheric nitrogen into the more accessible form of ammonia. In exchange for access to usable nitrogen, the plants provide carbohydrates produced during photosynthesis. Our goal was to find phages that may be used as a vector for horizontal gene transfer in rhizobia. Wild rhizobial strains were isolated from the root nodules of local legume plants collected during spring and summer of 2020. We also collected samples of the soil immediately around each root nodule and produced filtrates from them. We screened for phage in the soil filtrates by comparing 24-hour growth curves of rhizobia grown in TY broth with and without the addition of the corresponding soil filtrate. Rhizobial growth was measured by reading absorbance at 600 nm on a Tecan M200 plate reader. A decrease in absorbance during growth suggests the presence of a phage with lytic activity against that strain of rhizobium. So far we have evidence of lytic phage activity in one soil filtrate. Verifying the presence of phage by spot test, as well as testing additional soil filtrates for bacteriophage, is ongoing.

Title: Selective Media for the Isolation of *Paucilactobacillus wasatchensis*

Authors: R. Chase Wahlstrom, Dr. Craig Oberg, Dr. Matthew Domek

Affiliation: Weber State University

Abstract: The obligate heterofermentative bacteria *Paucilactobacillus wasatchensis* has been shown to cause late gas blowing in aged cheeses, which results in defects such as splitting and crumbling of the cheese block. The ability to quickly and accurately isolate *Plb. wasatchensis*, especially when it is present at low concentrations compared to other bacteria in a cheese sample, could be very beneficial to the dairy industry. However, the current protocol for isolating *Plb. wasatchensis* is time intensive and imprecise. The goal of this study is to accurately detect *Plb. wasatchensis* when as few as 103 CFU/g are present within 72 hours, as well as be able to inhibit competing SLAB and NSLAB with one media. Testing was conducted using 24 well plates in a Tecan infinite 2000 plate reader, in which 7 SLAB and NSLAB strains were tested in triplicate along with the *Plb. wasatchensis* type strain, WDC04. Each well was filled with carbohydrate restricted MRS (CR-MRS) broth containing 1% ribose, 2% Oxyrase, and .01% 2-deoxyglucose, a glucose analog. Results showed that under these conditions WDC04 could complete its logarithmic growth phase in 28 hours while the glycolysis inhibitor, 2-deoxyglucose, limited the growth of the 7 other SLAB and NSLAB strains. *Lacticaseibacillus casei* and *Lacticaseibacillus paracasei*, two of the most common NSLAB strains, showed the greatest level of inhibition between MRS broth (OD600 1.28 at 28 h) and CR-MRS+2-deoxyglucose (OD600 0.60 and 0.54, respectively) after 28 h. Preliminary results for the incorporation of 2-deoxyglucose into CR-MRS agar as a selective plating media for *Plb. wasatchensis* show promise. This method could be used to determine the presence of *Plb. wasatchensis* in cheese at low concentrations (103 CFU/g) versus the high concentration of SLAB (108 CFU/g) that obscure its detection with current isolation techniques.

PHYSICAL SCIENCE POSTERS

Title: Plasma Spectroscopy as Applied to Astrophysical Observations

Authors: Rebecca J. Nelson and Dr. Theodore Lane

Affiliation: Southern Utah University

Abstract: The interpretation of spectral lines for plasma characterization is a well-established diagnostic technique for determining number density and electron temperature, essential parameters for predicting radiation dynamics, local thermodynamic equilibrium, and atomic kinetics in laboratory and astrophysical environments. Specifically, spectra are the only way to compare predicted plasma quantities produced by hydrodynamic simulations, such as electron temperature, density, and fluid motion to what can be observed in astrophysical objects such as Supernova Remnants (SNRs) and Black Hole Accretion disks. To this end, we are using the atomic kinetics code FLYCHK to create synthetic spectra, which we will convolve to consider temperature and density gradients. We will then compare the spectra we created to spectra collected using the Chandra and XMM-Newton x-ray satellites to determine the accuracy of the hydrodynamic codes. This research is currently ongoing.

Title: Tissue Phantom Study to Characterize Detection of Cancer Cells with Raman Spectroscopy

Authors: Priscilla Lagunas, Haidy Rivera, Jordyn Hales, Jessica Jones, Dustin Shipp

Affiliation: Utah Valley University

Abstract: Raman spectroscopy is an effective method for tissue analysis that has been known to be a precise and non-invasive method for cancerous tissue. Using this technique may be useful during tumor removal procedures. The goal of these surgeries is to remove all of the tumor while preserving as much healthy tissue as possible. Using Raman spectroscopy during surgery involves the use of a Raman spectrometer to identify tumor cells near the surface of the removed tissue that could indicate cancer remaining in the patient. Our research includes mimicking the samples obtained from this procedure by using tissue phantoms. The tissue phantoms are made out of gelatin and doped with different densities of plastic microbeads. The beads represent tumor cells that may be spread throughout the tissue. Our goal is to gather data that would resemble what an actual tumor removal procedure would show. We have found that by adding appropriate amounts of skim milk to the tissue phantoms, the light scattering properties (i.e. scattering coefficient) of the tissue phantoms can reflect more realistic parameters. The Raman spectrometer measures spectra that are given off by the tissue, including the plastic targets. We then analyze the data using a software program designed by our research group. This software program will then help us determine how close we need to be to the beads in order to detect them. Through the continuation of this process, the collected data will help us determine a connection between the different scattering coefficients and the distance from which the targets can be detected. This supports ongoing research to quickly and accurately detect tumor cells and differentiate them from healthy tissue. This would help make the surgery less invasive and return faster diagnoses, compared to the current treatment options that are being used.

Title: An Exploration of a Novel Synthesis for Merocyanines

Authors: Jacob Newey, Kyler White

Affiliation: Southern Utah University

Abstract: Merocyanines are a class of dyes having clearly defined structural properties. Some of these compounds change color depending on the solvent they are dissolved in, a phenomenon known as solvatochromism. Molecules that display this property can be used to identify the polarity of solutions. Other possible uses include in sensors and in the field of molecular electronics to construct molecular switches. Brooker's merocyanine, or MOED, is one of the more common solvatochromic compounds. We describe a new route to the synthesis of Merocyanines that reduces the standard method two-day process of reaction and isolation to at most an hour. The reaction was optimized using MOED as the target molecule. The procedure is then used in the synthesis of a known MOED derivative as well as a novel compound. The previously unknown compound was characterized, and its properties are discussed.

Title: Synthesis and Characterization of Locked Dipyrroles for Insight into Energy Transfer in Biological Systems

Authors: Shardon T. Morrill, Mackay B. Steffensen

Affiliation: Southern Utah University

Abstract: Our work in collaboration with Dr. Dean of the physical science department is to inform the structure-motion function relationship between highly-efficient, native light-harvesting proteins of cyanobacteria and cryptophyte algae. Tetrameric pyrrole photosystems are used by these organisms leading us to our previous work regarding the synthesis of dipyrrole molecules. In contrast to the compact and complex nature of binding pockets within biological cells, in vitro, these dipyrroles are subject to rapid deactivation of their excited state due to torsional motion about the pyrrole rings. To address this issue, we have pursued binding of the torsional motion through methyl, ethyl, and propyl alkyl bridges to synthetically tether the pyrroles rings through two physical connections and attempt to mimic the conformations of the molecules in vivo. This will allow our collaborators to use specialized cold spectroscopy instrumentation to monitor the photo-initiated vibrations that mediate efficient, rapid, and long-range energy transfer.

SOCIAL SCIENCE POSTERS

Title: Assessing the Role of Prescribed Painkillers and its Impact on the Opioid Epidemic Presenter: Abel

Reed

Authors: Abel Reed, Dr. Vinod Chellamuthu

Affiliation: Dixie State University

Abstract: The U.S. is currently facing an opioid crisis that causes two out of three of the overdose deaths within our nation, while addicts of opioids suffer side effects such as depression, mood swings, loss of libido, headaches, and of course death. Over the past decade, the population of opioid addicts in the U.S. has increased, causing a negative impact on our upcoming generations nurture and development. According to data from 2018, 128 people in the United States die after overdosing on opioids every day. The consequence of the increased addicted population size is higher death rates among younger adults and a reduced life expectancy for the U.S. population. To understand why opioid addiction is rising in our society, we need to better understand the relationship between prescribed painkillers and the rate at which opioid addicts enter rehabilitation programs. We have developed a mathematical model that utilizes a system of nonlinear differential equations to investigate addictive phenomena in the opioid epidemic. We solved the model using a non-standard finite difference numerical scheme. Our numerical simulation results show a broad view of what factors are directly contributing to the growth of the addicted population within our society. We also plan to incorporate seasonality into the model to reflect the variability in prescription rate within opioid dynamics. Our model could be used by hospitals and rehabilitation centers to discern when their patients are most liable to become addicted as well as what factors are directly contributing to them becoming addicted.

Title: Is Thinness Truly Next To Godliness? Examining Moral Judgements Against Women With Larger Bodies in a Latter-day Saint Population

Author: Sydney Rasmussen

Affiliation: Brigham Young University

Abstract: Weight stigma exists in many ways within our society, though how exactly it manifests in a religious context has not been well-researched. This study investigates the relationship between female body size and perceived morality among college-age Latter-day Saints. 260 Latter-day Saint BYU students between the ages of 18 and 30 were randomly assigned one of two surveys: one featuring the image of a larger-bodied woman and the other featuring the image of a smaller-bodied woman both being similar in complexion and dress. The survey asked participants various questions regarding their assigned woman's moral character, with items adapted from the Ethical Behavior Rating Scale (ERBS) (Hill Swanson, 1985). Our analysis found significance when examining only female responses, $t(213) = 1.98$, $p < .05$. Thus, we found that college-age Latter-day Saint women did judge smaller-bodied females as being more moral than larger-bodied females. One main limitation to our study is that there were significantly more female participants than men. Future versions of this study should include a more balanced participant gender ratio and a larger sample size in order to either confirm or deny the significance of our findings.

Title: Parental Religiosity and the Coming Out Process

Author: Gabrielle Svozil

Affiliation: Brigham Young University

Abstract: Within the last decade, there has been an increased acceptance of LGBTQ (lesbian, gay, bisexual, transgender, queer) identity. In recent years, a growing number of organized religious groups in the United States have issued statements officially welcoming LGBTQ people as members. Many religious organizations also have taken supportive stands on the issues that affect LGBTQ people in America, such as the fight for freedom from discrimination, the solemnizing of same-sex marriage and the ordination of openly LGBTQ clergy. However, there are still many religions that oppose LGBTQ rights, identity, and expression. Religion has been a source of both solace and suffering for many lesbian, gay, bisexual, transgender and queer Americans. Within the family, religion has played a determining role in whether LGBTQ youth feel comfortable coming out, a process by which LGBTQ individuals accept and openly express their identity. This paper will focus on how religiosity of parents' effects whether their child feels comfortable being open about their non-heteronormative sexual identity. I use data from The National Longitudinal Study of Adolescent to Adult Health (Add Health) to determine religiosity of parent and whether the child reports a change in sexuality while controlling for race, gender, and parent education. I predict that high levels of parental religiosity will decrease the likelihood that the child reports a change in sexuality.

ORAL ABSTRACTS

ART ORAL

***Title:** From Dancing in the Desert to *Dancing with the Stars*: Contributions of Latter-day Saint Culture to Dance in Utah

Author: Diana Brewster, Miranda Fife, McCall McClellan

Affiliation: Brigham Young University

Abstract: The following paper examines the relationship of dance in Utah with its pioneer beginnings. We first look at the role of dance in the lives of the early members of The Church of Jesus Christ of Latter-day Saints who trekked west and settled in present-day Utah. Their recreative culture and doctrinal views on the body helped foster the practice of dance in their tightly knit community. Later descendants of these original pioneers carried forward the traditions of dance, reaching new levels of professionalism and performance. While there are many contributors to dance in Utah, this paper takes a particular look at the work of Willam Christensen and Virginia Tanner as dance educators and catalysts of the perpetuation of ballet and modern dance in the Beehive State. With the legacy of these and others, Utah continues to produce professional dancers who go on to teach and perform both locally and internationally.

Title: Rota Fortuna: Divining the Future of Viewership & Arts Consumption

Author: Courtney R. Davis

Affiliation: Utah Valley University

Abstract: As gallery and museum spaces closed their doors to visitors in 2020 due to Covid-19, arts organizations and artists sought opportunities to reinvent the viewing space. While many explored virtual exhibitions, some turned to the storefront as a locus of display in which to present site-specific public-facing installations, echoing the contemporary interest in the democratization of viewership. This paper focuses on *The Wheel of Fortune* (2020), a multimedia work temporarily installed in a consignment boutique in Taos, New Mexico. Based on the ancient theme of the Rota Fortuna, the collaborative effort of artists Sarah Bush and Tawni Shuler melded Victorian, Dada, and Surrealist impulses with the symbolic traditions of astrology, palmistry, and card-reading. A contemporary *memento mori*, *The Wheel* echoes the disequilibrium, disquiet, and irresolution of the historic summer of 2020. The shift to experimental and online viewing spaces also coincided with impassioned debates focusing on the function of museums and galleries as appropriate intermediaries of knowledge, prominence, and historical value. *The Wheel*, and similar installations, revives the centuries-old tradition of utilizing storefront windows for public consumption, a practice that arguably increases accessibility and egalitarianism. But what are the implications of privatized display? Does decentralized exhibition simply trade one form of hierarchy for another? This paper seeks to divine the future of viewership and arts consumption by examining the aesthetic and curatorial implications of Bush and Shuler's *The Wheel of Fortune*.

Title: Why We Adapt Tragedy: Parallels between the Orpheus Myth and Frankenstein Films (1931/1935)

Author: Madison Sheldrake

Affiliation: Brigham Young University

Abstract: Adaptation is an extremely popular mode of storytelling. Stories that are retold often hinge on universal themes that are applied to new audiences and ideals across generations. This paper focuses on two such stories: the Greek myth of Orpheus and the story of Frankenstein. These stories are similar in their tragic nature and their character arcs. By comparing the two, Orpheus through the modern musical *Hadestown* and Frankenstein through its first two film adaptations, the reasons tragedies are adapted so often are revealed, along with more hopeful themes from both stories. These themes are revealed through character arc. Both Orpheus and Frankenstein embody an arc that I call "the Orphic journey." In short, this arc refers to a character achieving great success, then succumbing to a flaw that leads to their tragic downfall. Analyzing Orphic journeys brings a tragedy's universal themes and message of hope to the forefront of the story, illuminating the true purpose of the original narrative and its adaptations. For Orpheus, this message is that sad stories show the possibilities of life as it could be and that love is worth fighting for, even when it's fleeting; For Frankenstein, this message is that sad stories show that things are not always what they seem, and that purpose is something you find for yourself. This paper uses the

analysis of the Orphic journeys in these stories to prove the existence of these messages within the tragic narratives. These hopeful messages, at first hidden by the tragic natures of the story, are what bring artists and audiences alike back to adapting tragedy.

***Title:** Ballet and Bonaparte

Author: Golda Dopp Ovalles

Affiliation: Utah Valley University

Abstract: This paper explores Napoleon Bonaparte's influence on the physical and fleeting art of ballet. His role as master choreographer of war has been studied extensively, with an exhaustive field of research relating to his manipulation of power. Relatively untouched by scholars however are the intricacies of how he used dance for personal and national gain, and what lingering effects survive to this day. The paper outlines the political peregrinations of ballet surrounding and during the Napoleonic years, from 1790-1815.

Organization is chronological, with four main parts: how the Enlightenment helped ballet survive the 1789 Revolution; the role dance claimed in the national fêtes of the Directory and Consulate; how Napoleon's cultural admiration of antiquity influenced ballet; and finally, how Napoleon's militant approaches shaped the pedagogy of ballet.

The argument is made that the Enlightenment, combined with Napoleon's strategic adoption of ancien regime characteristics, were necessary in perpetuating ballet as an art form. Napoleon's military defeat against Russia enabled the rise and popularity of Russian ballet and marked a shift in French dance culture.

***Title:** Healing Trauma in the Art Classroom

Author: Audrey Reeves

Affiliation: Utah Valley University

Abstract: Many U.S. students experience individual, social, and collective trauma, including systemic forces and oppression of minorities. This article addresses how a K-12 art education curriculum should better support students who have/are experiencing trauma. The author proposes more attention to four aspects of curricula, advocating for art teachers to guide students between art for self-expression, art to critique students' circumstances, art to imagine a joyful future, and art as an escape. It is important to balance all of these aspects of curricula, as solely expressing and critiquing trauma is a disservice to students. Art teachers need to also give space in the curriculum for hope and joy to promote student healing.

Title: Navigating Trauma While Seeking Connection And Community Through Dance During COVID-19

Presenters: LeGrande Lolo, Francesca DeMartino, Jessica Ketchum-Lee

Affiliation: Utah Valley University

Abstract: COVID-19, has had far reaching, devastating effects on everything from daily life to economics on a global scale, mental health being no exception. Joann Kealiinohomoku states that "Dance reflects the cultural traditions within which they developed." One can therefore assume that dances created during 2020 will reflect current events. Within our respective choreographic processes, each choreographer sought to use dance to explore human responses to COVID-19. Humans have a natural neural synchronization to an outside rhythm, called entrainment, which engenders connection to one another. Currently starved from human interactions, it's clear how essential finding community is. Trauma and negative emotions arise from a lack of socialization. Each choreographer chose to incorporate these facts into our three respective Modern Dance works. Using conversation, improvisation, and choreography, dancers applied personal experiences to create movements that reflected social interactions. Space and complex floor patterns were utilized to offer creative solutions while remaining socially distant. Gestural motifs, audible breath and diverging movement pathways reflected dancers' relationships to each other individually and as a whole. Unable to physically touch, it became essential to allow dancers to partner with each other through usage of dance props, line of sight and specific lighting. Breath by Jessica Ketchum-Lee explores the ideas of breath and synchronization to demonstrate how people unconsciously connect with one another. Red Thread by LeGrande Lolo, uses a physical set of ribbons, facilitating both abstract and literal partnering to explore socially distanced ritual and community building. In the Eye of the Storm by Francesca DeMartino, showcases how individual emotions are

translated into physical experiences, allowing audience members to empathetically connect and find personal meaning within their own pandemic experiences. From our combined intents, it is clear that dance, in this exploration, is an outlet for reconciling emotional pain and a desire for human connection.

Title: The Pierian Spring

Presenter: Nicholas Jolley-Harding

Affiliation: Utah Valley University

Abstract: A little learning is a dangerous thing

Drink deep, or taste not the Pierian spring

There shallow droughts intoxicate the brain

And drinking largely sobers us again.

- Alexander Pope

The Pierian Spring is a modern dance piece inspired by the poem of the same title from Alexander Pope's an Essay on Criticism. It seeks to explore the concepts of "knowing" and "not-knowing"--drinking deeply and the shallow droughts--and the descriptors experienced through them: hubris, exposure, ignorance, vulnerability, exploration, and humility. Through movement-based research and the trials of life, three types of knowledge came to fruition within the piece: general knowledge, self-knowledge, and knowledge of others.

This piece, above all else, showcases the individual journey of each dancer through physically embodied expressions of knowing and not-knowing. While the poem itself was the impetus of meaning-making, the inspirational choreographic methodologies of Trisha Brown, Ohad Naharin, and Liz Lerman, in pairing with the experiences and values of the choreographer and performers, facilitated the amalgamation of movement representative of the poem's interpreted intent.

BIOLOGY ORAL

Title: Using a Virus Model System to Determine the Effect of Ozone in Locker Room Sanitation

Authors: Justin Coles, Clark Madsen, Craig Steiner, Caleb Nyone, Josh Hansen, Berkley Scharmann, Stephen Scharmann, Niharika Mishra, Craig Oberg

Affiliation: Weber State University and McKay Dee Family Medicine Residency

Abstract: Viral infections can spread rapidly through a team with surface contamination a common vector for viral transmission between individuals. Ozone has been shown in several studies to be effective in inactivating viruses and bacterial pathogens. We examined the effectiveness of ozone for viral inactivation on solid surfaces in an active Division I collegiate locker room. Plastic sterile petri plates were inoculated with *E. coli* bacteriophage T7, (DNA non-encapsulated virus) which was used as the viral model system and placed in triplicate at a variety of distances (3-27 ft) from an ozonator (Extreme Ozone Co.) in a collegiate locker room. With the room emptied, the virus-containing plates was exposed to either 2 or 3 hours of ozone. The virus was harvested from the plates with sterile saline, diluted, and enumerated using the soft agar overlay procedure with *E. coli* B as the host. After incubating for 24 h at 37°C, viral plaques were counted on each plate and compared to controls not exposed to ozone. Results from the control and test plates verified the experimental procedure with virus successfully harvested at the expected concentration from the control plates. An ozone meter in the room measured a peak ozone level of 3.6 ppm and an average of 1.6 ppm during the 3-hour exposure. Results showed a significant decrease in viral load in 8/20 test plates between 50-97%. Plates laid next to each other showed wide variability in viral inactivation. When the ozone was run for 2 hours, no viral inactivation was observed. At 3 h exposure, ozone was observed to effectively reduce viral counts by up to two logs on some exposed plates, but the effect was variable and did not correlate to the distance from the ozone generator. The variable effect of ozone on virus inactivation may be related to several real-world variables not seen in previous studies. While duration of ozone exposure appears to play a role in viral inactivation (2-hour vs. 3-hour), other factors such as room ventilation and humidity could also play a role. Our results are consistent with other studies examining viral inactivation in aerosols and on surfaces, which also observed a 1-2 log decrease in viral load after ozone exposure. In comparison, when use of a similar methodology with two bacterial models (*Staphylococcus aureus* and *E. coli*), results showed consistent kill rates of <90%. While further study is needed, our work indicated that typical ozonation treatment of locker rooms may have more variable real-world results compared to experiments done in controlled laboratory settings and ozone should not solely be relied upon for locker room virus control.

***Title:** An examination of ITS1 secondary structural motifs in specimens of the genus *Equisetum*

Author: William D. Speer

Affiliation: ITS1 sequences from 19 *Equisetum* specimens representing 9 recognized species and 3 hybrid taxa were examined in this study. Most sequences had comparable lengths of 231 to 232 bp. However, the sequence for *E. sylvaticum* had a 62 bp deletion, making it only 170 bp in length. Secondary structures for ITS1 were predicted and evaluated. For each sequence, four structural motif regions were identified, folded individually, and concatenated for the final overall secondary structural prediction. The motif regions differed in length and exhibited varying degrees of nucleotide and secondary structural variation among the 19 sequences. One motif region (designated as Motif 3) appeared in this study to display consistent secondary structural variation that distinguished specimens of subg. *Hippochaete* and subg. *Equisetum*. At the same time, structural variation did not tend to unite conspecific specimens, nor did it consistently distinguish between different species. Except for one motif (designated as Motif 1), non-metric multidimensional scaling ordinations of motif nucleotide data distinguished between the two subgenera. Phylogenetic analyses of motif and complete ITS1 sequences were also performed. In most cases, these clearly grouped specimens according to subgenus. However, different specimens representing the same species were not always joined in the same clade. Possible causes for this observation may include geographically based variation or hybridization between species, as is well known for this genus. It appears that ITS1 is useful for delineating *Equisetum* specimens on a subgeneric basis but may not be as suitable for resolving relationships within and between species.

Title: Antimicrobial Metabolites of *Lactilactobacillus curvatus*

Authors: Dallin Leatham, Taylor Oberg, Robert Ward, Craig Oberg

Affiliation: Weber State University, Utah State University

Abstract: *Lactilactobacillus curvatus* is a common non-starter lactic acid bacteria (NSLAB) in cheese. If *L. curvatus* is induced to produce antimicrobial compounds it would be important to the food industry, since it could be used to inhibit pathogens and/or spoilage organisms in cheese. Using the *L. curvatus* WSU1 genome, bioinformatics analysis revealed genes for a metabolic pathway which utilized lactic acid to produce propanol and propionic acid, two antimicrobial compounds. Among these genes were three encoding for the enzyme diol dehydratase. This enzyme is present in *Lactobacillus reuteri*, a NSLAB that can utilize glycerol to produce 3-hydroxypropionic acid and 3-hydroxypropionaldehyde (reuterin), two antimicrobials. It is hypothesized that *L. curvatus* could also produce these compounds. Since these metabolic processes are anaerobic, cultures were grown in septum-sealed medicine bottles with the headspace purged using 95% N₂/5% CO₂. Cultures were grown in carbohydrate restricted MRS media containing either lactate, 1,2-propanediol, hydroxyacetate, acetate, or glycerol at an 80 mM concentration. They were grown in duplicate with half containing B12 because diol dehydratase is B12-dependent. A GC analysis was done to test for the presence of 3-hydroxypropionaldehyde, propionic acid, propanol, and 3-hydroxypropionic acid at day 0, 1 and 7. Preliminary GC results show that *L. curvatus* WSU1 cannot produce propionate from lactate but can produce propionate when given 1,2-propanediol. This indicates the genome is lacking the gene to convert lactate to lactaldehyde, but does have functioning genes to convert 1,2-propanediol to propionate. When grown on glycerol, small amounts of 3-hydroxypropionate were produced, indicating either the fermentation conditions were not ideal for the pathway or the diol dehydratase had less affinity for glycerol than for 1,2-propanediol. These results indicate the potential for *L. curvatus* WSU1 to be used as a functional adjunct in dairy fermentations."

Title: Effect of Inorganic Salts on the Growth of Probiotic Lactic Acid Bacteria

Authors: Joshua O. Gee, Tallon Nielsen, Daniel N. Clark

Affiliation: Weber State University

Abstract: Dairy-based products are often used as delivery systems for probiotics. Unfortunately, many people miss the benefits of probiotic-enhanced products because they cannot consume dairy foods due to lactose intolerance or allergies. Our research explores using plant-based products as a delivery system for probiotics. Previous research showed promising results, but many commercial products contain phosphate salts which have been shown to inhibit some probiotic lactobacilli. Our research examined the growth of lactic acid bacteria (LAB) in a plant-based product, "oat milk," and the impact of phosphate salt preservatives on LAB growth. Oat-based beverages with phosphate-containing salts were inoculated with

24 h cultures of commercial probiotic strains: *Lactobacillus acidophilus* LA-5, *Bifidobacterium* BB12, *Lb. casei* 431, *Lb. casei* F-19, *Lb. rhamnosis* BLC-48, and *Lb. rhamnosis* LGG. LAB survival was enumerated using MRS agar for *Lactobacillus* and MRS+cystine for *Bifidobacterium* strains. Plates were incubated anaerobically at 35°C with counts done at day 0, 7, and 14. Results showed some strains of LAB grew in the oat-beverages with or without added salts and that all cultures survived, regardless of the composition, however, most strains preferred growth in specific brands. Simple Truth "oat milk" brand gave the best growth results for most strains. We expect differences in probiotic strains growth was due to the composition of each brand. The protocol was repeated using only Chobani oat-beverage products that were either treated with phosphate salts or left untreated. All cultures survived independent of the phosphate concentration, but most did not grow over the 14 days of refrigerated incubation. Four of five strains survived approximately 10-fold better in the treated product. These results show the addition of phosphate-containing salts as stabilizers in "oat milk" do not inhibit most probiotic strains so it can be used as a probiotic delivery system.

Title: Burn Scar: An Assessment of a Course-Based Undergraduate Research Experience on the Effects of the Brian Head Wildfire

Authors: Sheridan Lloyd and Carrie J. Bucklin

Affiliation: Southern Utah University

Abstract: This study aims to assess the implementation and results of a course-based undergraduate research experience (CURE) for students in an ecology course at an intermountain-west, primarily undergraduate institution. This CURE focuses on place-based learning in regards to a large (70K+ acre) wildfire that affected a local area. Due to the direct effect that place-based research experiences have on students, CUREs have shown to benefit students' long-term knowledge retention, and can lead to a greater motivation in these students to make significant impacts in their communities and future fields of research. Participants in this study consisted of the students in two sections of an ecology course. We used questionnaires with both open and closed-ended questions to assess how the course impacted the students' knowledge and opinions of both wildfires; questionnaires were administered at the beginning and end of the semester. Preliminary results show an increase in factual knowledge of wildfires and a greater appreciation for the biological sciences as whole.

Title: *Paucilactobacillus wasatchensis* WCD04 biofilm formation and adherence to stainless steel

Authors: Lizell A. Mejias, Michele C. Culumber, Craig J. Oberg

Affiliation: Weber State University

Abstract: *Paucilactobacillus wasatchensis* WCD04 is a non-starter lactic acid bacterium (NSLAB) that can cause gas production during cheese aging. This NSLAB is thought to be an environmental contaminant, but its reservoir is unknown. Since *Plb. wasatchensis* doesn't survive pasteurization, its persistence in cheese manufacturing could be caused by post-pasteurization contamination due to biofilm formation in cheese vats. We investigated physiological conditions in which *Plb. wasatchensis* reaches optimal growth for biofilm formation on stainless steel. Biofilms were grown on sterilized stainless steel washers (5.92 cm²) in the wells of sterile, 24-well polystyrene culture plates. Washers were added to 2 ml of MRS+R broth amended independently for each experiment. Wells were inoculated with either 10 or 100 µl of a 4 d culture of *Plb. wasatchensis* WDC04. Variables tested were pH (4, 5, or 6), galactose concentration (0.5%, 1%, or 2% v/v), lactose (1% or 2%), glucose (1% or 2%), and oxyrase (1%). Biofilms developed for 1 wk at 30°F. Washers were aseptically removed and rinsed with sterile distilled water to remove planktonic cells. Attached biofilm was removed by vortexing in sterile saline for 1 min. The solution was serially diluted and plated in triplicate on MRS+R agar and incubated at 30°F for 5 d. Biofilm growth was below detection at pH 4 and 7. Biofilm formation utilizing residual sugars was the greatest at pH 6 with 2% galactose (6.8 x 10⁴ cfu/cm²). Similar growth was observed with 1% lactose (5.2 x 10⁴ cfu/cm²). Cell recovery was the greatest overall with 1% oxyrase (5.8 x 10⁶ cfu/cm²). *Paucilactobacillus wasatchensis* exuberates exopolysaccharide synthesis under low-oxygen conditions, as they exist in the cheese packaging process. Understanding optimal growth conditions for biofilm formation will provide opportunities to test methods for the prevention or removal of *Plb. wasatchensis* biofilms that may occur in dairy processing facilities.

BUSINESS ORAL

Title: A Descriptive Analysis of Cross-National Differences in Job Satisfaction by Gender

Authors: Maureen Andrade, Jonathan Westover, Angela Schill, Jacque Westover, Cambree King

Affiliation: Utah Valley University

Abstract: Comparative studies on job satisfaction for men and women have been inconclusive, with some finding that women are more satisfied on the job than men and others finding no difference. Previous research has also identified similarities and differences in gender and job satisfaction globally based on cultural, economic, social, and political factors across countries and world regions. Overall, however, limited cross-national or global research has been conducted in this area. The current study uses International Social Survey Program data to investigate the role of gender and country on job satisfaction. Variables involving extrinsic and intrinsic factors, work relations, and work-life balance are examined. While it is inconclusive whether women are more satisfied than men, findings show there are clear differences between the factors that contribute to job satisfaction between males and females. Factors such as helping others, working weekends, and flexibility to deal with family matters are on average more important to women in the workplace than men. On the other hand, men prefer better pay, promotional opportunities, and physical effort in relation to women. Breaking the variables down by country shows where the greater disparities exist and where genders within countries behave opposite of the norm. These instances highlight areas where management can shift their focus to better serve both men and women individually in the workforce of their country.

Title: Does charter growth wreck district schools, or does competition lift all boats? Trends in school proficiency among public schools in Utah

Author: Michael Mamo

Affiliation: Westminster College

Abstract: The goal of this project is to estimate the impact of charter school expansion on traditional district schools. On the one hand, as charter school enrollments grow district schools face financial losses that could harm teaching and learning in the district schools. At the same time, however, it is possible the harmful effects on school resources are more than offset by the competitive effects of charter schools that are reflected in improvements in student achievements in district schools. Many similar studies have arrived at conflicting conclusions and have found evidence supporting one or another claim regarding charter schools. Part of the ambiguity in outcomes stems from problems related to the availability of data and the failure to sufficiently account for heterogeneity. In this project, I propose to explicitly address these questions in a few ways. I will utilize school-level panel data that would allow me to account (and control for) school-specific, unobserved effects that would otherwise lead to biased and inconsistent results. Second, I will use a variety of measures of charter competition including the number of charter schools in the vicinity of the district school as well as the quality of charter schools. The underlying logic to focus on the quality as opposed to the quantity of charter schools is the likely correlation between charter school location decision and the poor performance of the district school. Such correlation is unlikely to exist between the quality of the charter school and poor performance of the district school. Another improvement that I propose in this project involves the estimation strategy. I propose a random trends model that will allow me to introduce a second source of heterogeneity into the estimating equation.

Title: Self Efficacy, Emotional Intelligence, Self Determination and Learning Strategy: Student Survey Results and Relationship to Practice CPA Exam Scores in an Auditing Course

Author: Jeff Davis

Affiliation: Weber State University

Abstract: A long and rich research history in self efficacy, emotional intelligence, self-determination, and learning strategy ties these cognitive constructs to academic performance (Bandura, 1977; Schwarzer and Jerusalem, 1995; Mayer, et. al., 2004; Gagne and Deci, 2005; Pintrich and DeGroot, 1995). This current study reports survey results of a self-reported questionnaire related to these constructs obtained from the literature. The paper makes a simple relationship to academic performance of these students in the form of two practice exams for the auditing section of the CPA exam. Students took the first practice exam before taking the survey, and took the second practice exam after taking the survey. Preliminary analysis suggests that the test scores improved after being introduced to the cognitive principles incorporated in the survey questions. More research needs to be done to isolate any confounding variables for the improvement on the second test.

Title: The Disparity in Understanding Governmental Policy and Healthcare Economics, from Premedical Students to Physicians

Author: Pierce Bassett

Affiliation: Brigham Young University

Abstract: Last year, more than fifty-three thousand hopeful undergraduates submitted their application to medical school. While coming from diverse backgrounds, these students have all successfully completed virtually identical prerequisite science courses, in addition to a standardized exam known as the MCAT, which measures student aptitude on these blanket prerequisite courses in order to demonstrate their readiness for a medical education. Once in medical school, a student will learn the basic sciences, how to interact with patients, and try to determine the type of physician that suits them best to continue with in their careers. In total, this process usually requires eight years of formal post-university education. While this system achieves its designed purpose to train physicians in the processes of diagnosing and treating, it fails to address some of the most pertinent topics which our contemporary society faces; healthcare policy and economics. This paper illustrates the current disparity of both premedical and medical students' preparatory education in these fields, proposes simplistic solutions to address this issue, and elaborates on the quintessential nature of understanding these topics in order to properly address the healthcare policies and accompanying economics that impact everyone.

Title: A Descriptive Analysis of Cross-National Differences in Job Satisfaction by Gender

Authors: Maureen Andrade, Jonathan Westover, Angela Schill, Jacque Westover, Cambree King

Affiliation: Utah Valley University

Abstract: Comparative studies on job satisfaction for men and women have been inconclusive, with some finding that women are more satisfied on the job than men and others finding no difference. Previous research has also identified similarities and differences in gender and job satisfaction globally based on cultural, economic, social, and political factors across countries and world regions. Overall, however, limited cross-national or global research has been conducted in this area. The current study uses International Social Survey Program data to investigate the role of gender and country on job satisfaction. Variables involving extrinsic and intrinsic factors, work relations, and work-life balance are examined. While it is inconclusive whether women are more satisfied than men, findings show there are clear differences between the factors that contribute to job satisfaction between males and females. Factors such as helping others, working weekends, and flexibility to deal with family matters are on average more important to women in the workplace than men. On the other hand, men prefer better pay, promotional opportunities, and physical effort in relation to women. Breaking the variables down by country shows where the greater disparities exist and where genders within countries behave opposite of the norm. These instances highlight areas where management can shift their focus to better serve both men and women individually in the workforce of their country.

Title: Business Ethics Education in Utah: How are we teaching ethics and why?

Author: Chelsea Dye, Chari Farr, Dara Hoffa, Ron Mano

Affiliation: Westminster College

Abstract: "In an article on why business ethics need to receive greater prominence, Clayton Browne noted that although the study of general business topics like marketing, accounting, finance, and management are important to business education, it is equally important to have a real understanding that how you operate your business reflects not just on you, but impacts your neighbors and the larger community.

Although higher education for business looks to agree that ethics education is important, the method by which we impart this education varies greatly. This paper examines the business programs at each of the eight institutions included in the Utah System of Higher Education in addition to the three non-profit private institutions in Utah and looks at the extent to which ethics is included in the business curriculum and the importance each institution places on business ethics curriculum.

Browne, Clayton. (n.d.). The Reasons for Studying Business Ethics. Small Business - Chron.com. Retrieved from <http://smallbusiness.chron.com/reasons-studying-business-ethics-18877.html>"

EDUCATION ORAL

Title: Competency-Based Education: Opportunities and Possibilities

Author: Anthony Beal

Affiliation: Snow College

Abstract: Competency-based education (CBE) is lauded for its ability to get higher education to a larger number of nontraditional students in assessing the mastery of competencies rather than how many hours they have spent in a classroom (Ordonez, 2014; Surr, 2017). This personalized approach of higher education gives credit according to demonstrated competencies regardless of specific time measurement (Le et al., 2014). CBE is focused on the learner both in terms of affordability and accountability with its relatively low tuition costs and high academic standards for its learners (Hansen, 2016). It is recognized as a strategic method for ensuring students are career-ready upon completion of college (Martinez & Poon, 2015; Worthen & Patrick, 2015).

Opposers of CBE claim that competency models can only be as good as the assessment mechanisms they utilize (Ordonez, 2014; Shapiro, 2014). Additionally, some feel that CBE programs are widening the divide between traditional and non-traditional approaches to higher education. Lastly, some worry that CBE graduates will possess the skill, but not the theoretical knowledge necessary to compete in the workforce today (Ordonez, 2014).

In their groundbreaking study, Johnstone and Soares focused on new approaches in higher education and their potential for changing the economic landscape. CBE topped the list for two reasons: its direct application of knowledge and real-world skills and its ability to simultaneously offer quality and affordability (Johnstone & Soares, 2014).

Though the CBE approach at each school is unique, they have each focused their efforts on students and how they learn. A majority of the programs mention working adults as their target audience. Students are supported to take control of their education by creating learning plans, making their schedules, and more easily monitor their academic progress (Hansen, 2016).

Title: The Journey Through Higher Education: The Role of Mentors in Student Veteran Educational Experiences

Authors: David Brian Kartchner, Kristin A. Searle

Affiliation: Utah State University

Abstract: Veterans are a growing presence on college campuses around the country. As student veterans become more ubiquitous, there is an increasing need to better understand this unique population of students. Veteran Critical Theory (VCT) addresses the necessity of understanding the student veteran experience by focusing on student veterans' narratives and counter-narratives while pushing for a generative model of practice and inquiry, in place of the transitional and deficit models that are widely used at academic institutions. We report on data from a pilot study of student veterans' experiences with higher education, focusing on the role of mentoring in their ongoing educational journeys. The project was conducted as a narrative inquiry using journey maps and a single interview, which was analyzed using VCT. We found that the experiences of student veterans, while enlisted in the military, impacted how they perceived and interacted with faculty. In the military, superior commissioned military officers command respect, which is reinforced by tradition and military law. This respect takes on verbal and physical forms that demonstrate deference to the authority of commissioned officers. When student veterans are no longer enlisted, some continued to treat those in authority, including faculty, in similar ways. Additionally, we address the positive impact that mentors, especially mentors who are veterans themselves, can have on student veterans. We discuss how mentors are not addressed by VCT. We conclude with implications of our findings regarding mentors pertaining to the educational experiences of student veterans as they navigate civilian educational institutions, as well as a discussion of how universities might leverage these findings to change how they serve student veterans.

Title: Developing Student-Teacher Relationships through Integrated STEM Curricula

Authors: Kristin A. Searle, Colby Tofel-Grehl, Andrea Hawkman, Beth MacDonald, Mario Suarez

Affiliation: Utah State University

Abstract: Research repeatedly shows that students who are more culturally connected do better in school. Further, many non-dominant students value relationships of caring with their teachers. In this paper, we draw on elementary teachers' and students' experiences with the Elementary STEM Teaching Integrating Textiles and Computing Holistically (ESTITCH) curriculum and professional development to show how culturally responsive, integrated science, technology, engineering, and math (STEM) curricula can create

opportunities for dialog across cultural differences and the development of student-teacher relationships. The ESTITCH curriculum centers experiences of migration, immigration, and forced relocation, experiences which are familiar to many students in Utah schools today, whether through their own experiences or those of their ancestors. Drawing on teacher reflections from professional development, reflective teacher interviews post-PD and post-instruction, and classroom observations, we explore the opportunities ESTITCH provided for student-teacher relationship building. For instance, one teacher in our study described teaching the history of the French and Indian Wars in conjunction with the ESTITCH curriculum. One of their Indigenous students got very upset at the use of the word Indian. The teacher was able to use the conversation to explain the historical usage of the term Indian and also as an opportunity to learn more about the student's Navajo background. While this presented a teachable moment in relation to the usage of Indian throughout history, it also provided an opportunity for the teacher to learn more about the student. Based on our analyses, we conclude with a discussion of how integrated STEM curricula can foster student-teacher relationships and dialog across difference, particularly through the use of difficult or challenging topics like immigration, migration, and forced relocation.

***Title:** Creating a Successful Secondary Dance Education Program

Author: Nichole Ortega

Affiliation: Utah Valley University

Abstract: Through the study of dance education and dance advocacy, the relevance and importance of successful secondary dance programs has been proven time and time again, especially concerning the positive outcomes for participants and school communities. These same programs can also be used as an extremely effective learning tool for future dance educators, specifically in navigation of diverse learning environments. As a result of several years of observation and evaluation of Dance Education majors during their student teaching assignment, it became evident that students were aptly prepared to teach dance curriculum in the secondary schools but often struggled with the diverse situations and/or environments they were assigned. Every secondary school requires modifications of best pedagogy practices for optimal learning in that specific environment. As a result of my ten years as a secondary dance educator and 13 years as a university faculty member involved in a Dance Education program, I am aware of several successful secondary dance programs throughout the state of Utah and some in surrounding states, all with distinct environments. In this presentation, I will be sharing my research based on interviews of over 20 secondary teachers with successful dance programs and the specific elements of these diverse programs. The goal of this research is to provide helpful information for enhanced Secondary Dance Education pedagogy practice at the university level, allowing future dance educators more success in their student teaching and professional teaching assignment.

***Title:** Greater Rudeness: Interruptive Behavior in the Graduate School Classroom

Author: Thomas Terry

Affiliation: Utah State University

Abstract: Professor Fiona Draper surveyed the classroom filled with M.A. and Ph.D. students, ignoring vocal outbursts by two men. She gestured to a woman. "Studies have shown that men interrupt women more often than women interrupt men," she said, "and are more forceful and loud in classroom situations. So, Sandy, you go right ahead." Draper provided the premise for this study, exploring whether male graduate students do attempt to dominate and interrupt female graduate students in classroom situations. Interruptions are defined as speaking without raising a hand, blurting out comments or questions, "stepping on" those speaking, and talking over others, as well as similar behaviors. Research was conducted in a southern university's research methods class of 16 men and 11 women taught by a female professor over two 75-minute periods.

In this preliminary study results were mixed. Percentagewise, men and women interrupted others without raising their hands at virtually the same rate. However, men did talk over others in the class nearly twice as often, but were also twice as likely to raise their hands and wait to be called on by the professor. Women half-raised their hands before interrupting far more often than men. Overall, men's approach to the class seemed informal, and they appeared less engaged. A third were not closely following the flow of classroom discussion. In sharp contrast, women seemed connected and always fully aware of the flow of conversation. However, women made fewer comments, percentagewise. When women left the classroom during class, they did so quietly and closed the door carefully, unlike the men, who let the doors slam shut behind them. The researcher concludes that further research is indicated to create a more nuanced and

comprehensive answer to the study's hypothesis that men's classroom behavior is more interruptive.

***Title:** Tracking Professional Development through the Creation of Culturally-appropriate Educational Materials

Authors: David R. Byrd, DeeDee Mower, Penae Stewart, Rich Fry, & Nadia Wrosch

Affiliation: Weber State University

Abstract: Teacher candidates bring with them knowledge, experiences, values, memories, and beliefs that are culturally and socially determined when they enter their teacher education programs. Some of these factors will align well with the ideas and experiences they gain in their program, both through course work and practical experiences. However, when this knowledge, experiences, and so on are challenged, the candidate can feel some significant disequilibrium. Both types of learning can provide growth. Whereas the former can reinforce and add to existing beliefs, the latter can create instances where the teacher candidate must reevaluate and reconsider their stance and find ways to come to terms with the discordant knowledge. One area in teacher preparation where this situation can take place is in materials development.

The present study examines the professional development of three US teacher candidates creating culturally appropriate stories and accompanying educational materials for Thai orphan students. Using grounded theory, the researchers triangulated philosophy statements, journals, and interviews to track how developing materials for students in a different culture than their own provided opportunities for professional growth for the participants. Initial results indicate that the candidates were able to change their teaching beliefs as they considered for whom they were creating the materials and what concepts needed to be addressed in the stories and other materials and how they could accomplish these goals. The greatest struggle and growth came as they reflected on what they created and why. The results indicate that the candidates were able to change their teaching beliefs as they considered for whom they were creating the materials and what concepts needed to be addressed in the stories and other materials and how they could accomplish these goals. The greatest struggle and growth came as they reflected on what they created and why.

Title: Improving Self-Determination for High Students with Disabilities: ActNow

Author: Shirley Dawson

Affiliation: Weber State University

Abstract: Self-determination and self-advocacy are critical skills for students with disabilities (SWD). The Apply and Communicate for Transition Now (ActNow) Discussion Tool was purposefully developed using evidence based practices (EBP) and best practices by practitioners working directly with SWD. Practitioners from community and school agencies express concern that students who apply for support often lack self advocacy and awareness to discuss their strengths and needs in relation to their chosen post high setting. This lack creates barriers for students to communicate their goals and needs to be successful in life after high school. ActNow incorporates collaboration and communication regarding student goals into one document via a systematic process. Research to evaluate use ActNow to improve SWD self-determination was supported by the Institute of Education Sciences in a one-year randomized controlled trial design. Participants (n= 115) were matched on key variables before random assignment. In the RCT both treatment and control groups received regular tiered transition services, activities, and support while the control group also received ActNow instruction and intervention. As part of a two year analyses, initial results demonstrate that ActNow is an effective practice to increase student self-determination. Both group and individual preliminary results will be shared and discussed. Overall treatment students had greater increases in self-determination than the control group across all disability categories and service levels. Benefits of the tool and intervention allow for: increased interagency communication, needs from stakeholders to be addressed, field testing of EBP and best practices, support of legal compliance, opportunities to teach self-advocacy, awareness and determination, choice-making, and social skills in a systematic student-centered format, and use of authentic settings to support community, education, and work experiences while students are still in high school.

ENGINEERING ORAL

Title: Lumped Capacitance Method Analytical and Experimental Evaluation

Authors: Kyler Reinhold, Owen Telford, Collin Cutler

Affiliation: SUU

Abstract: In this paper, a simple experiment was conducted to evaluate the limitation and validity of assumptions associated with the lumped capacitance method. This method evaluates temperature variations due to transient convection heat transfer. The experiment was conducted using a small aluminum cylinder, first placed into hot water, and then in cold water. The results of the experiment were compared with three different analytical approaches. One is an Incomplete Response Method, another is a Predict and Check Method, and the last is Aluminum Cylinder Convection Coefficient Method. The validity and limitations of the lumped method are then discussed.

Title: Effectiveness of Plane Wall Radiation Shielding

Authors: Cierra Salcido, Collin Cutler

Affiliation: SUU

Abstract: Radiation shielding is the reflection of thermal radiation by using materials whose surface has a high reflectivity and low emissivity. This experiment attempts to replicate thermal radiation shielding by placing two identical steel plates parallel to each other and heating one of the steel plates with heating pads. After recording the temperature of each steel plate, a reflective aluminum plate was placed between the steel plates to shield thermal radiation created by the heating pads. The heating pads were heated up and the temperature of the steel plates were measured. Heat transfer analysis was performed to calculate the theoretical temperature of the steel plates and the required heat transfer rate to maintain the final experimental temperatures. The experimental temperature difference of the steel plates was 1.15% different with no shielding and 13.78% with shielding. The experimental heat transfer rate used was 41.53% with no shielding 78.56% with shielding. The experimental heat transfer rate was significantly greater than the theoretical, meaning the experiment required more heat to maintain the final temperatures of the steel plates. Future improvements consist of spacing around the border of each plate to maintain equal distance between each plate, increased heat generation by heating pads to allow more radiation heat transfer, adding insulation to both steel plates, and performing the experiment under vacuum to reduce convection.

Title: Cost Effective Solar Water Heater

Authors: Aaron J.G. Dockins, Noah A. Mollner, Kyler A. Reinhold, Omar R. Campos

Affiliation: SUU

Abstract: Hot water has been used around the world for centuries for bathing, medical purposes, cleaning, and cooking. In today's society the source that is used to heat water is typically a water heater that utilizes a non-renewable energy source to heat the water. In this paper, a passive solar-powered water heater will be constructed and tested to verify if the sun's energy can be an alternative source of energy in locations where other options are limited. Before testing, a theoretical analysis for the constructed solar water heater was conducted and theoretical values were predicted. The theoretical values were then compared to the values obtained after the experimental results were obtained. The theoretical water temperature values were much higher than the actual experimental temperature, but the overall water temperature still increased to a comfortable temperature. Thus, indicating the sun's radiation could be a potential alternative energy source under certain conditions.

Title: Direct Evaporative Cooling - Simple Analysis

Authors: Matt Bennion, Skyler Ipsen, Colby Thorton, Andrew Logan, Austin Banks

Affiliation: SUU

Abstract: Evaporative coolers are an excellent alternative to air conditioning systems for dry climates. Contrary to A/C removing moisture from the air, evaporative coolers lower temperatures by the latent heat of evaporation and increasing air moisture. Warm air energy is used in evaporative cooling to evaporate water, resulting in cooler temperatures. There are 3 types of evaporative coolers: direct, indirect, and hybrid systems. This paper focuses on direct evaporative cooling (DEC). The efficiency, cooling capacity, consumption of water, and volume capacity of DEC's can be calculated by measuring inlet and outlet temperatures and relative humidities. To support the theory and measure these attributes, a simple in-house DEC cooler was built and tested. Ultimately, even though not as efficient as commercial coolers, it was found that our evaporative cooler decreased the temperature and increased the relative humidity of the ambient air.

Title: Analysis of Electrical Resistivity and Conductivity of Materials

Author: Noah Swenson

Affiliation: SUU

Abstract: As temperature of a material increases, the electrical resistance of the material rises in correlation; this linear relationship allows for a theoretical prediction of that material's electrical resistance using the coefficient of resistance. This coefficient of resistance differs for every material and must be found by experimentally determining a resistance at a specific temperature. Through performing tests that increase the temperature of a material, the linearity of temperature and resistance can be observed, and a coefficient of resistance can be found with relative accuracy for the material through the linear relationship's slope. A positive, linear correlation was experimentally observed, and an accurate theoretical value for the resistivity of copper was found. Therefore, a prediction of a material's resistance at any temperature is possible within 5% error, and a linear correlation can be confirmed.

Title: Calibration and Testing of Budget Extensometer to Accurately Evaluate the Modulus of Elasticity of Steel Wire

Authors: Owen Telford, Alicyn Astle, Collin Cutler, Cameron Pepi

Affiliation: SUU

Abstract: The modulus of elasticity is one of many properties used when predicting the behavior of materials. An accurate measurement of the modulus of elasticity is found using precise measurements of elongation and stress. Commercial testing machines use extensometers and load cells to measure these values; however, these machines are very expensive for educational lab use. At Southern Utah University, Dr. Jacob Bishop created cost-effective universal testing machines and purchased a budget extensometer. The purpose of this project is to calibrate the extensometer to give accurate results of elongation. Multiple tensile tests were performed on steel tie wire using the universal testing machine and the calibrated extensometer. The average modulus of elasticity found was 25,220 ksi with a percent error of 13.09%. Performing the test very slow with a strain rate below 0.05 1/hr results in poor data. The recommended strain rate to perform tensile test is from 1 to 2 1/hr. A motor can be incorporated with the testing machine to allow consistent movement of the cross head during multiple tests.

Title: Semi-Translucent Concrete

Authors: Tanya Jones, Matthew Bayreder, Mako Bennett

Affiliation: Southern Utah University

Abstract: The need for energy efficiency and strength in building materials is growing across the United States and the world. Concrete is a commonly used high strength building material but significantly lacks in aesthetic characteristics and translucent properties it is gray, dark and dull. Semi-translucent concrete is an alternative being studied extensively by universities and companies across the globe. This experiment studies the feasibility of using glass to substitute for gravel as an aggregate in concrete. This study includes testing the structural, optical, and thermal properties of concrete with varying amounts and types of glass when used as aggregate in concrete. The resultant data indicated that the maximum stress of regular concrete was 16.26 MPa, while the glass aggregates ranged from 11.48 to 18.77 MPa. The optical tests indicated that clear glass aggregate allowed the broadest range of wavelengths to pass through the concrete at 418.31 to 739.04 nm. The coffee cup calorimeter thermal tests indicated minimal differences between the glass aggregate and the control mix of concrete at 2.2 J/g.°C (avg.) and 3.00 J/g.°C, respectively. Data suggests using different size of glass as an aggregate to be an effective replacement for gravel and sand in buildings using concrete as aesthetic and structural elements.

Title: Heat Transfer Analysis of Eicosane During Melting

Author: Sabrina Kim, Bill Maxwell

Affiliation: Southern Utah University

Abstract: Interest is growing in utilizing the thermal energy stored or released when a material changes phase. There are a variety of applications for this energy from building Heating, Ventilation, and Air Conditioning (HVAC) systems to passive heating and cooling of satellites. The possibilities to use this type of energy are just beginning to unfold. In previous research, inward freezing of Eicosane (Paraffin, C₂₀H₄₂), as PCM was tested and analyzed while the performance of the system is studied and improved. The scope of this project includes evaluating the performance of C₂₀H₄₂ phase change materials (PCMs) for releasing thermal energy (melting). The melt-testing and performance of the paraffin PCMs was

performed. Data from thermocouples was collected, and heat transfer analysis consisted of (I) conducting a melting incremental convection heat transfer analysis utilizing data from thermocouples; (II) implementing a calorimetric heat transfer analysis; and (III) evaluating the melt front vs. time from data was performed. The knowledge gained from this project will be used to further research on new applications and optimize the existing system.

Abstract: Controller Design Using Laguerre Basis Functions

Author: Philip Olivier

Affiliation: Engineering Analysis and Design

Abstract: A new feedback controller design technique using Laguerre basis functions is presented. The input to the technique is a) the plant transfer function, $G(s)$ b) the transfer function, $T(s)$, that embodies the desired closed loop behavior, and c) the order of the desired controller, with to be determined transfer function $C(s)$. Laguerre expansions of the known and unknown transfer functions, as well as the PRODUCT PROPERTY of Laguerre basis functions are used to determine the coefficients of the unknown controller.

Title: Construction Key Performance Indicators Initial Reactions to the COVID-19 Pandemic, A Case Study on Design-Build Project

Authors: Xinzi Cui, Qingyang Chen, Mohamed Askar

Affiliation: Southern Utah University

Abstract: Tracking and carefully interpreting an array of key performance indicators (KPIs) helps a construction company build long-term resilience and performance while also meeting short-term financial and performance goals when affected by the novel coronavirus. Based on the novel coronavirus, COVID-19, most construction companies throughout the US were affected by closures or slowdown.

This study's primary purpose is to determine the impact of covid 19 on the construction key performance indicators, such as delays caused by public service interruption or by temporary termination of work on-site. Especially when dealing with some risky projects, how to avoid accidents to monitor the profit margin to ensure the project's smooth progress. Seven important KPIs were determined and a dashboard was designed to follow up the performance indicators during the project construction phase. A gap analysis was processed to compare the actual performance or results with what was expected or desired. A comparative study between the performance indicators before and after COVID-19 was accomplished. The study included an observation of major KPI statistics that were affected by COVID-19 and needed to be added to these KPIs under the danger of COVID-19 to improve them. The study is implemented on a design-build project.

The context of the COVID-19 pandemic is the nowadays themes in the construction industry. Initial coding identified familiar terms in the Covid response, like reduced resource sizes, fewer projects and cost reduction. The study concluded several ideas to improve the use of Key Performance Indicators in the construction industry during crisis times.

Title: Effect of COVID-19 on Risk Management of Construction Projects - A Case Study on High-Rise Building in China

Authors: Hongyu Hu, Mycrae Tebbs, Mohamed Askar

Affiliation: Southern Utah University

Abstract: China's construction industry is China's pillar industry. Since 2004, the year-on-year contribution rate of the construction industry to GDP has averaged around 6.3%. Unlike the United States, China is still a developing country. Public facilities and infrastructure are still a key part of the country. State-owned enterprises occupy a dominant position and play an important role in the industry. Based on the statistics of 118 listed construction companies in 2018, the total revenue of construction state-owned enterprises and local state-owned enterprises accounted for 94% of the entire sector, and the proportion of net profit reached 91%. The impact of COVID-19 in China from December 2019 to March 2020 has had a significant impact on the construction industry. There is no doubt that the COVID-19 isolation system has caused many risk categories and the construction risk management has become more complicated and inappropriate.

This research focuses mainly on an environmental project, which encountered risk management difficulties due to COVID-19. The main objective of this research is to develop a model that includes a risk dashboard with different risk indicators. The research methodology focuses on how to determine the

possible risks of construction projects and use good management methods to control them. Risk management should focus on risk control and adopting active measures to control risks by reducing the probability of risk occurrence and/or risk impact. Under the circumstance that the established goals remain unchanged, change the implementation path of the plan to fundamentally eliminate specific risk factors.

The research offered a risk management model and possible suggestions and procedures to avoid the risks, as possible.

Title: Construction Safety Plans Initial Reactions and Responses to the COVID-19 Pandemic - A Case Study on Commercial Project

Authors: Olive Musimbi, Hang Chu, Mohamed Askar

Affiliation: Southern Utah University

Abstract: The construction industry has faced many alterations through the years. In response to the COVID-19 pandemic, the most recent change can be compared to the revises in personal protection equipment (PPE) as research on health and safety has progressed over time. Most construction companies throughout the US were affected by closures or slowdown. Initial coding identified familiar terms in the COVID response, like face coverings, hand sanitizer, social distancing, and health screening of all employees prior to entering the construction site, such as temperature checks, put forward some requirements to guard against Coronavirus at work, using remote monitoring to supervise the construction site, submit, and review and revise problems on-site by means of Internet communication.

This study's main objective is to develop a construction project safety plan to match the current situation. The Associated General Contractors of America (AGC) reported in March 2020 that Coronavirus was starting to affect construction through delays, logistics issues in obtaining material and Personal Protection Equipment (PPE) and worker concerns. A short survey, COVID-19 and Construction Safety, was developed in Google Forms for Construction Companies. A link to the survey was posted on social media and emailed out to contractors. The Centers for Disease Control and Prevention (CDC) has issued construction workers guidelines that include handwashing stations, social distancing, and face coverings. Most of the survey responses included that it is required to focus on the PPE at the office and on construction sites. Based on the survey question responses, an updated construction safety plan has been developed. The safety plan has been tested on a commercial project.

The study concluded several ideas to improve the health and safety of the construction workers and equipment.

Title: Delay Challenges in the USA Construction Projects due to COVID-19, A Case Study on Commercial Project

Authors: Yufan Xiong, Zimei Zhang, Mohamed Askar

Affiliation: Southern Utah University

Abstract: The United States construction industry is one of the largest construction markets worldwide, with annual expenditures of over \$1,293 billion in 2020. However, the Coronavirus (COVID-19) pandemic has harmed the construction industry, prompting project delays, cancellations, and increasing the project's overall cost. With construction projects facing delays, disruptions and uncertainty of completion due to the COVID-19 pandemic, many construction companies are looking to their force majeure coverage and delay clauses to determine what is considered eligible for claim submission. The Coronavirus has delayed close to 5,500 U.S. projects as of June 2020. There have been various publications issued on the topic of mitigating risk and legal issues associated with the construction industry response to COVID-19.

The main objective of this study is to focus on a regularly updated project schedule is crucial because project teams rely on accurate schedules to plan and do their work. This study focuses on outlining the best practices for construction project planning, scheduling and delay analysis updating of various activities in one commercial project, which is done using MS Project software. The resources of each activity are determined and allocation is done using the software. An updated schedule, which helps to finish the project well in time with optimum resources and delay reasons and analysis, has been considered in this study on the commercial project.

The study concluded several ideas to improve the construction project progress and minimize the projects' overall cost, such as contractor adjustment of crew sizes, shifts or equipment to speed or slow the progress.

Title: The Impact of COVID-19 on Construction Project Financial Management - A Case Study on Heavy Civil Construction Project

Authors: Xin Wan, Mohamed Askar, Jared Baker

Affiliation: Southern Utah University

Abstract: On 11 March 2020, the World Health Organisation declared COVID-19 to be a pandemic, with the WHO "deeply concerned by the alarming levels of spread and severity" of the outbreak. In response, the financial markets have plummeted to levels not seen since the 1987 stock market crash. This affected the construction industry's financial status and brought many uncertain factors to the project's financial management, such as problems related to the project cash flow. These problems are bound to cause significant distress to the project's finance. The importance of financial management has increased substantially compared to the previous periods.

This study's main objective is to develop a project financial management model to help improve the financial situation of construction projects. The secondary objective is to analyze the impact of COVID-19 on project financial management by focusing on a series of specific data to improve the financial status, such as the project's cash flow. This study used pie charts and data comparison methods to examine the impact of COVID-19 on the financial management of a heavy civil construction project and through the final data analysis, to show the effect of the COVID-19 pandemic and suitable response methods. The financial model was tested on a heavy civil construction project to summarize several measures to deal with the impact of the COVID-19 pandemic.

The study concluded several possibilities of reducing the impact of COVID-19 on the project financial management and reduced the project costs by optimizing productivity. The study recommended some effective measures to control financial expenditures and project costs.

Title: Developing a Quantitative Quality Control System to Overcome the Impact of COVID-19 on the Construction Projects in the USA. A Case Study on Commercial Project

Authors: Xingqi Yu, Mohamed Askar, Jared Baker

Affiliation: Southern Utah University

Abstract: Construction is a significant contributor to the USA economy. The industry has more than 680,000 employers with over 7 million employees and creates nearly \$1.3 trillion worth of structures each year. Unfortunately, the outbreak of COVID-19 has changed all of that, disrupting the construction industry's pace. Construction laborers are required to work while maintaining social distance, resulting in reduced productivity and poor quality.

This research's primary goal is to develop a quantitative quality control system to overcome the negative impact of COVID-19 on the quality of construction projects in the USA. Secondary objectives are to focus on the regular monitoring of the construction site's conditions of the commercial project and effectively solve the quality problems. The methodology of this research is to outline the best practices for using application software and quality checklists to discover, raise, and solve problems of the construction process due to the effect of COVID-19. A quality dashboard and statistical analyses were developed to measure the quality of the construction items and the general quality index. The software will be used for monitoring each problem and scheduling solutions. More complete checklists and management methods have been considered, ensuring that the project meets a certain quality level with practical strategies, solutions and safe communication methods.

The research concluded several ideas to identify, resolve and report project quality issues in a timely manner to protect workers' safety and ensure project quality, such as improving the quality checklists for COVID-19, internet monitoring and spot-checking quality of the project.

Title: Applying Binary Phase-Shift Keying to an open environment antenna pattern range

Authors: Cade A. Moody and Justin B. Jackson

Affiliation: Weber State University

Abstract: Many studies have been done related to antenna patterns and their importance in defining an antenna's characteristics. The Weber State University Electrical & Computer Engineering department developed an open source antenna pattern range to record antenna patterns in an open environment. This pattern range used a simple noise subtraction method where it takes a measurement of the current electrical noise in the environment and a measurement of the broadcast signal. The system subtracts the noise from the measured signal to determine the magnitude of the signal. This uses two

software defined radios (SDRs), one for the transmit antenna and another for the antenna under test (AUT). The system transmits the signal, rotates the AUT and retransmits. This sampling is done for a full rotation. From this data, antenna patterns are generated for the AUT's radial radiation pattern.

While this approach is able to acquire antenna patterns, these patterns are generally noisy due to external radiation affecting each sample. Phase-shift keying (PSK) has been proposed to improve the rejection of these external signals. Data is sent from the transmitting antenna to the receiving antenna. The data received is verified against the information transmitted to accept or reject the signal. Adding this level of discrimination will allow for the validation of signals from the transmitter and external signal will be rejected.

A PSK algorithm has been developed to aid in the discrimination of these external signals. This SDR program transmits data packets for signal verification utilizing binary phase-shift keying (BPSK). This is what helps verify the data. Verified signals are added to the antenna pattern characterizing the AUT. The program offers the option to not plot false data points when the noise in the environment exceeds the threshold of which the system can verify the signal similar to modern networking techniques.

Title: Fully Printed Solar Cells Design Project

Authors: Daniel Philpot, Justin B. Jackson

Affiliation: Weber State University

Abstract: Recent advancements in inkjet technology have enabled the material printing of semiconductor devices. Due to potential cost reduction and simple design customization, inkjet printing has become a significant field of semiconductor research. The purpose of this design project was to develop a solar cell printing process, fabricate the solar cell using the Dimatix DMP-2850 materials printer, and evaluate the solar cell's performance.

A solar cell printing process based on existing research was developed. Multiple layers of material ink were deposited on a glass substrate using the DMP-2850 materials printer. The organic solar cell stack structure consists of four different material layers. Each material layer required unique printing parameter settings to produce the desired patterns. Throughout the fabrication process, the solar cell was heated on a hot plate between material layer printing.

The developed printing process was implemented to produce functional solar cells. The solar cell's performance was evaluated using an ELH light source, Keithley source meter, and IV software on a computer. The solar cells were exposed to the light source and a voltage-current sweep was performed. Voltage vs current plots were obtained using the IV software. The voltage-current curves depict the solar cell's open-circuit voltage and closed-circuit current.

The developed printing process has successfully been utilized to fabricate fully printed solar cells. The evaluation process characterized the solar cell's open-circuit voltage and closed-circuit current when exposed to a specific light source. The fabricated solar cells and IV curve data require further analysis in order to better quantify the solar cells performance characteristics. The developed printing process will serve as a baseline for further solar cell research at Weber State University.

HUMANITIES, PHILOSOPHY, AND FOREIGN LANGAGE

Title: The Overlooked Diderot

Author: Zahran Austin

Affiliation: Weber State University

Abstract: This essay aims to explore an often-overlooked work by Dennis Diderot, *Les Bijoux Indiscrets*, and to place it within its historical and literary context. The novel may not be a masterpiece; however, it is heavily reflected of the rest of Diderot's works. Themes found in this novel appear regularly throughout his other writings and the novel marks a turning point in Diderot's life and career. *Les Bijoux Indiscrets* also mirrors several literary and social trends sweeping France as it was written. While most scholars either ignore or malign this work, this essay intends to demonstrate that it is worthy of further interpretation and analysis.

Title: *Bartleby, the Hypothetical*

Author: Brady Earley

Affiliation: Brigham Young University

Abstract: The Law and Literature movement has long recognized the contribution of Herman Melville to

the field with works such as “Bartleby, the Scrivener.” The legal analysis of this story has often been viewed as a response to the legal philosophy of Melville’s father-in-law Chief Justice Lemuel Shaw. In doing so, scholars have implicitly recognized the way in which “Bartleby” is employed as a hypothetical to Shaw’s judicial reasoning. Explicitly exploring this novel implication of “Bartleby” uncovers the vast influence of the hypothetical on American legal thinking that immediately followed Melville’s short story. While most scholars agree that legal issues influenced Melville’s literature, I argue that the influence also went the other way; Melville has impacted the law’s development, specifically in the way he invites legal minds to consider the often-overlooked consequences of their logic. From the case method in law schools to the recent Supreme Court decision in *National Federation of Independent Business v. Sebelius*, the use of hypotheticals has become foundational to the development of American law. In turn, Melville’s discernible and lasting impact on the law articulates the transcendence of his literature that has posthumously endeared Americans to his work.

Title: “Something large and old awoke: Eco-poetics and Compassion in Tracy K. Smith’s *Wade in the Water*”

Author: Kaitlin Hoelzer

Affiliation: Brigham Young University

Abstract: Tracy K. Smith’s volume *Wade in the Water: Poems* (2018) connects environmental degradation and racial injustice and responds to these issues with a call for compassion. In this paper, I situate Smith’s work within Black ecocriticism, which moves beyond pastoral aesthetics to identify the oppressive structures that tie racial injustice to environmental degradation. I also argue that *Wade in the Water* engages with the work of contemporary Black theorists such as bell hooks, Brittney Cooper, and Charlene Carruthers, who argue that compassion is necessary to fight oppression. *Wade in the Water*, in particular the poems “Watershed,” “Wade in the Water,” and “An Old Story,” discusses both racial and environmental injustice and violence, but at the same time, Smith’s book is infused with a compassion the book and other scholars argue is essential to fight unjust systems and bring about healing. *Wade in the Water* joins other contemporary Black women theorists in offering up a vision of a compassionate society that recognizes the value in all humanity as well as the earth.

Title: Recreating the Anastasis in 3D

Author: Bob deWitt

Affiliation: Utah Valley University

Abstract: The so-called “Anastasis” was the 11th-century iteration of the Church of the Holy Sepulcher in Jerusalem. After the destruction of the Constantinian-era Church of the Holy Sepulcher by the “Mad Caliph of Cairo,” al-Hakim bi-Amr Allah in 1009, the site lay in ruins until the Byzantine emperor, Michael IV signed a treaty with the Caliph al-Zahir in 1038 in which the emperor was allowed to rebuild the church at his own expense. The edifice that arose on the ruins of the Church of the Holy Sepulcher was very different than the original church and came to be called the “Anastasis” or “Resurrection.” This church stood until extensively remodeled in a Romanesque style by the Crusaders in 1149 (the version that we see today). Nothing of the Anastasis remains except portions that were incorporated into the Crusader church. In my paper I use the surviving archaeological, visual, and written evidence to recreate with 3D software the likely appearance of the Anastasis as constructed by the Byzantines and compare it to the original Constantinian structure. This both demonstrates what the church may have looked like and how 3D models can help illuminate long-lost structures from the past.

LETTERS, LANGUAGE, & LITERATURE ORAL

Title: Putting It on the Page: Grief and Loss through Fiction

Readers: Lisa Christensen, Chanel Earl, Dallin Hunt, Madalyn McRae

Affiliation: Brigham Young University

Four MFA students share short fiction addressing different types of loss. Here are questions they asked as they wrote—and that they ask their listeners to consider: How do literary or aesthetic elements enable writers to share the intensity of grief or loss? How do speculative elements potentially enhance this process? How do texts focused on grief or loss enable both writers and readers to better understand and process difficult experiences and feelings and needs?

***Title:** Nuclear Bombs, Love Letters, and Grandmothers: Beauty is Truth

Readers: Thew Curtis, Carma Hilland, and Kalli Abbott

Affiliation: Brigham Young University

What do memoirs about nuclear bombs, love letters written in couplets, and essays with lyrical musings about grandmothers have in common? In contexts of this panel, they all grapple with the “real”—and do so in modes spanning the narrative-lyrical spectrum. Three MFA students share works of creative nonfiction and poetry showing how narration, reflection, and semiotic form translate tactile/cerebral experience into meanings—into perceptions of beauty as truth—that readers can apprehend, feel, or consume. Listeners might ask how creative nonfiction or poetry preserves, palimpsests, transfigures, or otherwise harvests “real experience” to fuel readerly connections to the “I” while simultaneously inviting precise awareness of beauty as truth.

PHYSICAL SCIENCE ORAL

Title: 3D-Printable Cell Phone Spectrophotometer for Chemistry Education

Authors: Brittany Christensen, Chris Monson

Affiliation: Southern Utah University

Abstract: High school chemistry classes typically teach about light over several classes. This is commonly done from a largely theoretical perspective, perhaps with a demonstration to better illustrate specific aspects of light and its interactions with matter. At a college level, the interaction of light with matter is usually taught with spectrophotometers. However, the cost of a classroom set of spectrophotometers and the difficulty using them means many schools may not have access to them. We have designed a 3D-printed spectrophotometer that is inexpensive and uses student cell phones as detectors. This device contains three cuvette holders and a spot for a smart phone camera to view all three of the resulting spectra. In addition to the 3D-printable device, we have developed a lab to use with the devices that can help teach high school students concepts from absorbance and reflection to creating a calibration curve and identifying concentrations of unknown solutions. This cell phone spectrophotometer may be more accessible to schools due to its inexpensive design and can be used to teach the concepts within light chemistry more effectively. Students will also be able to explore a new field of chemistry with this hands-on spectroscopy lab and may discover a new interest and appreciation for the study of chemistry.

Title: Inverse frit semipermeable PDMS membranes

Authors: Mikey Savage, Aubriel Koehler, Megan Jensen, and Christopher Monson

Affiliation: Southern Utah University

Abstract: Separations of liquid mixtures are important in a number of scientific fields. Separation techniques use a variety of criteria to determine how molecules are separated, but several common methods use molecular size. Semipermeable membranes have holes of specific sizes to allow molecules of that size or smaller to pass through the membrane, and are commonly made of cellulose. We have created porous membranes out of polydimethylsiloxane (PDMS), an elastomer. We create these porous membranes using a PDMS and magnesium mixture. When the PDMS is polymerized, the magnesium is locked in place, and then we dissolve out the magnesium to create our membranes. We are testing the filtration of these membranes using water and proteins of varying size. As expected, so far we have found that using larger magnesium pieces results in better water flow and poorer filtration because larger holes in the membrane are created. However, the filtration does not behave as might be expected with relatively large magnesium pieces creating membranes that have some protein filtering abilities. We will report our results working with different sizes of magnesium, which we hope may eventually lead to membranes that are as capable as those used in a dialysis machine.

Title: Using Silver Nanoparticles to Detect Early Onset of Disease

Authors: Porter Wilkes, Payton Riggs, Jonah Babbel, Christopher Monson

Affiliation: Southern Utah University

Abstract: Silver nanoparticles are of interest because of their chemical, antimicrobial, and other

properties. We have developed a method to fabricate silver nanoparticles using a microfluidic device made of PDMS. Through this method, we can consistently form high concentrations of nanoparticles of the same size and shape using common reagents for silver nanoparticle fabrication (silver nitrate, sodium hydroxide, ascorbic acid, and a specific capping ligand, which coats the outside of the nanoparticle, determining its final size and shape). Citric acid is commonly used as a capping ligand, but we have tested several non-conventional ligands, including common biological molecules. Specifically, we have compared a lipid (1,2-dioleoyl-sn-glycero-3-phospho-L-serine), a vitamin (vitamin B), and several proteins (BSA, Casein, and IgG) and have observed differences in the nanoparticles produced when using these capping ligands. We can identify these differences by examining the nanoparticles' abilities to fluoresce using fluorescence spectroscopy. We observed that nanoparticles made from the distinct proteins fluoresced differently. We have examined the effects of diluting the concentration of nanoparticles and have found that as the nanoparticle solution is progressively diluted, the fluorescence spectra shows a trend of blue-shifting / increase in intensity, followed by stabilizing at approximately $\lambda=460\text{nm}$ / decrease in intensity. We have also examined the nanoparticles formed from mixtures of ligands (protein/protein mix and lipid/protein mix) and have observed that these nanoparticles fluoresce differently than nanoparticles formed from each of the pure capping ligands. Our objective is to identify distinguishing features between the fluorescence of nanoparticles fabricated using different biological samples as capping ligands, with the vision that this research could lead to new methods of identifying diseases at early stages by comparing the fluorescence of nanoparticles created from samples of subjects believed to have a disease to those who do not.

Title: Home Made Raman Spectrometer

Authors: Hamza Samha, Dr. Mathew Rowley

Affiliation: Southern Utah University

Abstract: Raman Spectroscopy is one useful method for determining the chemical makeup of samples. Raman Spectroscopy relies on Raman scatter, an event where visible light is used to excite a sample to a virtual excited state. This state is very short-lived, and the sample will quickly return to the ground electronic state but with vibrational modes activated. The relaxation emits a photon whose energy is lower than the excitation photon by the amount of vibrational energy now held by the sample. Thus, a spectrum of the Raman scatter photons is characteristic of the vibrational structure of the sample. These characteristic vibration modes can give insight into the chemical structure of the sample and may even be unique enough to provide the chemical identity when compared against a database of known spectra. We are designing and building an inexpensive spectrometer to be used in both teaching and research here at Southern Utah University. In addition to the designing the optics of the spectrometer, this project involves designing detection and amplification circuits, a hardware controller, and both control and user-interface software with detection and sample analysis in mind. Once it is completed, the performance of the apparatus will be characterized using a sample with experimentally known vibrational modes. We ultimately hope to use the instrument in collaboration with others to study the surface enhancement of Raman signals by nanomaterials.

Title: Changing the paradigm on Copper Nanoparticle formation

Authors: Jessie Fischer, Tanner Stenlund, Christopher Monson

Affiliation: Southern Utah University

Abstract: Copper nanoparticles have a variety of uses and applications in many different fields. Current fabrication methods start with copper ions and build them up to the desired nanoparticle size. We developed a new way to synthesize copper nanoparticles starting with a sheet of solid copper and sonicating it in hydrochloric acid. While copper is a relatively unreactive metal and isn't known to react with HCl, this method has been found to break down solid copper into nanoparticles in a predictable fashion. Using UV-Vis and fluorescence analysis as well as atomic force microscopy, we were able to determine that nanoparticles are being created and that the concentration of HCl affects their formation. Additionally, these nanoparticles are stable over long periods of time, unlike traditionally fabricated nanoparticles which tend to decompose relatively quickly. Furthermore, preliminary data suggests that the nanoparticles may be able to catalyze the formation of additional nanoparticles under certain conditions. We are currently further exploring the properties and fabrication of these nanoparticles.

Title: Biomolecular separation via microfluidic devices

Authors: Payden Harrah, Christopher F. Monson

Affiliation: Southern Utah University

Abstract: Microfluidic devices consist of channels small enough to control the flow of fluid inside them with great precision, which allows the device to perform many scientific and medicinal functions. In particular, microfluidic devices allow for the separation of biomolecules based on weight, charge, and function. Microfluidic devices are required to balance functionality and cost. Often, devices with multiple functionalities are more complex and therefore expensive to fabricate. As microfluidic devices continually expand in functionality and decrease in cost, many new applications develop, in our case the identification and characterization of biomolecules in different samples including tissues, soil, and blood. The applications of identifying the biomolecules present in these various samples can be used in extremely diverse scientific fields. We have developed a microfluidic device that offers a cost-effective field flow fractionation system which has the potential to separate biological materials in a complex sample easily and efficiently. We will present our work on this device.

Title: Possible Synapsid Tracks from the Lower Jurassic Moenave Formation, Southwestern Utah

Authors: Holly Hurtado, Jerald D. Harris, Andrew R.C. Milner

Affiliation: Dixie State University

Abstract: Sedimentary rocks from southwest Utah preserve a diversity of tracks from the Lower Jurassic Moenave Formation. Among these animals were early dinosaurs and crocodylians, but two previously undescribed, tetradactyl footprints preserved at the St. George Dinosaur Discovery Site at Johnson Farm (SGDS), do not match the morphologies of either dinosaurian or crocodylian tracks. SGDS 18 is a toe-tip only trackway that includes drag marks between steps, possibly made in wet sediment. SGDS 190 is a single, isolated track with short digit impressions that lack obvious claw marks. Originally, these tracks were tentatively referred to the ichnogenus *Brasilichnium*, but this is uncertain. Quantitative measurements of the tracks were taken for comparison to those of other ichnotaxa. Our preliminary results find similarities to multiple ichnotaxa, but lean toward mammalian or near-mammalian synapsid interpretation.

Title: Evaluation of Super Fund Removal Action at the King Edward Mine

Authors: Robert Davidson, Andreas Lippert, Charles Davidson, Tori Schaffer, Dale Harber

Affiliation: Weber State University

Abstract: There are thousands of abandoned uranium mines located in the Four Corners Area from mining during the 1940s through the 1970s. The King Edward Mine complex ranked high on the Manti-La Sal National Forests list of CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) sites due to both environmental and safety issues, which include discharge of water contaminated with radionuclides and metals, eroding waste rock piles, and open adits. The site is on the west bank of South Cottonwood Creek, which flows south and is used for irrigation on Ute Mountain Ute allotments and culinary water for the city of Bluff, Utah. The aim of this study was to test the effectiveness of the superfund action at the King Edward Mine complex. Water and soil samples from the remediated mine site were analyzed for six elements to determine if the removal action is working. The elements analyzed were arsenic, cadmium, lead, selenium, uranium, and vanadium. Four water samples and four soil samples were collected from different areas around the mine site. Water samples from the mine adits and soil samples from the mine substantially exceeded the elemental concentration limits for drinking water set by the EPA. Water samples taken from the stream above and below the mine had concentrations that were lower than the EPA drinking water regulations for five of the elements studied. The uranium concentrations from the samples taken upstream and downstream were higher than EPA drinking water regulations, but they were not statistically different. Therefore, there is no evidence of additional seepage coming from the mine into the stream at the time of this study.

Title: Investigating Mutual Inductance Coefficients using Theta Pinches

Authors: Thayne Hansen, Shaun Cluff, Theodore Lane

Affiliation: Southern Utah University

Abstract: Theta pinches are devices that are frequently used in science demonstrations. Theta pinches used to crush metal objects have not been used for anything more than crushing empty aluminum cans, our experiments will push the capabilities of a theta pinch to its limits. In order to do this, we have created a modular Theta pinch that allows for different coils of wire to be attached to our capacitor. By varying

coil loop density, wire gauge and maximum voltage in the capacitor, experimental values for coefficients of mutual inductance can be found. These can be compared to measured can deformation values determined by a known pressure, allowing for the efficiency of the Theta pinch to be determined. These values can then be used to optimize Theta pinches for the crushing of various other metal objects. This work is currently ongoing.

Title: Rocketing ahead with fusion?

Authors: Christopher Hooper, Phil Matheson

Affiliation: Utah Valley University

Abstract: "Direct Drive Fusion" rocket motors have recently become of interest with the advent of start up companies such as Princeton Satellite Systems and their speculative foray into nuclear fusion driven thrust. Assuming heating mechanisms are developed to produce the required temperatures, we examine the basic parameters of such a rocket which place constraints on its operation. We consider feed rates and fusion rates necessary to sustain a given level of power. Unlike schemes to produce commercial fusion, the relevant plasmas must fuse over shorter time and distance scales, and at high temperatures and densities. This undergraduate project is a simple sketch of the parameter space based on rudimentary physics, intended to give insight to the magnitude of creating such a formidable rocket.

Title: The Fractal Dimension of Product Sets

Authors: Clayton Williams, Machiel van Frankenhuijsen

Affiliation: Brigham Young University, Utah Valley University

Abstract: There are several notions of dimension used in fractal geometry, which coincide for many sets but have important, distinct properties. Using methods from nonstandard analysis, we define a nonstandard Minkowski dimension with the property that $\dim(A \times B) = \dim(A) + \dim(B)$. That is, our new dimension is "product-summable". To illustrate our result we generalize a classical example from geometric measure theory to show that the standard upper Minkowski dimension, as well as the Hausdorff dimension, are not product-summable. We also include a method for creating sets of arbitrary rational dimension.

SOCIAL SCIENCE ORAL

Title: Politics, Religion, and Values as Predictors of Support for Sexual Assault Reporting and #MeToo: A National Sample in the United States

Author: R.C. Morris

Affiliation: Weber State University

Abstract: On October 15, 2017 at 2:21PM actress and activist Alyssa Milano posted the words "Me Too" to her Twitter account. In a little over 12 hours, more than half a million people had posted Me Too in response. #MeToo has catalyzed a platform, empowering victims to disclose incidents of sexual assault not previously reported. The Bureau of Justice Statistics (BJS) data shows that reported cases of rape/sexual assault went from 393,979 in 2017 to 734,632 in 2018, an increase of 86.5%. With more than 165 million women/girls in the U.S., based on BJS numbers, sexual assault reporting for this category should be around 27,642,272 lifetime cases, a far cry from current numbers. Despite a growing number of reports spurred by the #MeToo movement, reporting accounts for less than 0.003% of sexual assault. In this moment of increased support for #MeToo we continue to wonder about the factors keeping sexual assault reporting to less than a percentage point. This study draws upon an emerging literature investigating the linkage between a person's self-reported political orientation and their participation with a religious community; we do this by introducing a novel examination of value-identities related to Conformity and Tradition. Results of our analysis find that religiosity and political identification is complexly correlated to sexual assault reporting and support for #MeToo. We further hypothesize that religion acts as a primary source of socialization for higher-order values, with values of this nature filtering down into value-based-identities conceptualized as Conformity and Tradition. Our further results find that value-identities based on Conformity and Tradition are statistically significant predictors of sexual assault reporting and #MeToo. We conclude with a call for an examination of the role political and religious contexts play as a source of primary socialization "functionally antecedent" to the value-identities keeping reporting and support low.

***Title:** Ripple in Still Water: Psychedelic Rock Resistance

Author: Theresa Martinez

Affiliation: University of Utah

Abstract: Psychedelic rock music sprang from a fascinating amalgam of influences, but perhaps none more so than the Beat Generation. Several Beat authors and poets had settled in San Francisco in the 1950s, sowing the seeds of countercultural dissent and advocating the use of mind-expanding drugs as a pathway to freedom from the quintessential American status quo. At the same time, a Cold War ethos that encompassed a brutal and costly war in Vietnam provided an unsettling and disillusioning sociohistorical backdrop to the era. These elements would have a profound influence on the counterculture in the San Francisco Bay Area, including the psychedelic rock bands from this milieu who would sing their own particular brand of resistance music in their time. This paper is an exploration of psychedelic rock music through a theoretical framework that builds on dramaturgical approach as well as oppositional culture and resistance theories: a framework that can be equally termed performance as resistance as well as oppositional performance. Through a content and thematic analysis of the lyrics of selected psychedelic rock bands, the paper will reveal frank oppositional performance in the psychedelic music era.

Title: A Summary of the Science of Play in Early Childhood

Authors: Reetta Saaski, Abbi Covington, Sarah Prince, Michael J. Guynn, Dannelle Larsen-Rife

Affiliation: Dixie State University

Abstract: Play is uniquely beneficial to children's development in early childhood and is jeopardized by the growing use of electronic forms of play. Increasingly too many children have access to electronic devices starting in infancy which not only negatively affects their learning, but also affects their attachment to their primary caregiver during this critical period of brain development. Children learn through play and play is essential to a child's growth and development. Play promotes academic, social, and emotional benefits in children, and play involving physical activity also promotes physical health. In infancy children mainly play with their primary caregivers and the quality of their play is influenced by their attachment style. The quality and complexity of children's play develop in relation to the developing attachment relationship between the primary caregiver and the child. The attachment style that develops influences how beneficial the play can be for a child. If the primary caregiver is engaged with the child and supportive by providing guidance and encouragement they help the child to achieve new skills that may be too difficult for the child to master on their own. The child learns much more in play with a caregiver than a child whose primary caregiver is absent, otherwise occupied, or inconsistently available. The early developing attachment with the primary caregiver determines a lot of one's development and play is a primary opportunity to strengthen the relationship between a child and a parent by promoting pleasure and joy. Excessive screen time reduces opportunities for authentic interactions which are important in the play. This paper advocates for policy prioritize play, especially relational play to promote secure attachment and child development

Title: From Mormon to "None": Dynamics of Latter-day Saint Religious Disaffiliation in Utah

Author: Rick Phillips

Affiliation: University of North Florida

Abstract: Within the United States religious switching is common. However, when members of The Church of Jesus Christ of Latter-day Saints change their denominational status, they tend to abandon organized religion altogether. This pattern has been observed for almost 40 years. However, the number of Latter-day Saints leaving religion has accelerated in the 21st century, particularly in Utah. Using ethnographic data collected along the Wasatch Front, this paper presents a sociological framework for studying religious disaffiliation in Utah, and examines why Latter-day Saints are less likely than others to switch to a new denomination when they leave their religion. I provide cultural, demographic, and political reasons for this phenomenon..

Title: Silicon Visions: Regional Entrepreneurialism and the Technology Economy in Utah's Silicon Slopes

Authors: Jeremy Bryson, Melissa Jensen

Affiliation: Weber State University

Abstract: Hoping to imitate the successes of Silicon Valley, metropolitan areas around the United States have tried to create similar high technology entrepreneurial regions in an effort to attract high paying jobs

and a skilled workforce. While researchers have already begun to explore the environmental histories, landscape conflicts, and social impacts of Silicon Valley's development, we know relatively little about the second wave of these self-styled technology hubs. This paper explores one of these newer technology innovation hubs, known as Silicon Slopes in Utah, in order to understand the role of regional-scale entrepreneurialism in shaping contemporary metropolitan landscapes.

Title: A Nuclear Crisis in east Asia: China, Taiwan, and the United States

Author: Sasha Woffinden

Affiliation: Brigham Young University

Abstract: Taiwan's status is heavily contested. While Taiwan maintains that it is an independent nation, its self-proclaimed status is unrecognized by most international organizations and much of the world. This lack of worldwide recognition is due in part to the massive influence of the People's Republic of China, which, for various purposes, contends that Taiwan is part of China. In the interest of maintaining diplomatic ties with China, the United States also does not formally recognize Taiwan as an independent state. The United States' current policy on Taiwan is to uphold strategic ambiguity, which has been the prevailing U.S. stance towards Taiwan since Congress passed the Taiwan Relations Act of 1979. My research analyzes the question of how the United States can defend its interests in Taiwan while avoiding nuclear war with China, and I analyze four U.S. courses of action towards this end: First, the United States could make

an official commitment to defending Taiwan; second, the United States could abandon Taiwan; third, the United States could arm Taiwan; or fourth, the United States could seek a diplomatic, international resolution. I conclude by consolidating three of the options into a multi-step plan, ultimately recommending that (1) the United States formally defend Taiwan, (2) the United States continues to arm Taiwan with conventional weapons, and (3) all else failing, the United States pursues an international solution on Taiwan.

***Title:** Leadership: A Protean Institution of the Mind and of Civilization

Author: Pierce Bassett

Affiliation: Brigham Young University

Abstract: As the inherent nature of leadership is continuously redefined in contemporary society, there is accentuating emphasis placed on its utilization and comprehension. The primary objective of this research paper is to examine this emphasis on leaders in the 20th and 21st century, analyzed from the perspective of a university student. This research explores the study of specific styles, differences, and examples of leaders within community and throughout history. Further studies into the development of leadership processes based on have the potential for the synthesis of ultramodern techniques in the advancement of ethics, diversity, and communication in all facets of leadership positions.

***Title:** Housing and Autism Spectrum Disorder: Insights from Individuals and Families

Authors: Jonathan Westover, Maren Paulsen, Kari Bushman, Teresa Cardon

Affiliation: Utah Valley University

Abstract: Background: Autism is one of the fastest growing disabilities in the country. Housing for autistic adults remains elusive for many, and access to funding and supports is often nonexistent. The aim of this project was to better understand the current and future housing needs of autistic adults in Utah from the perspective of autistic individuals and their caregivers. Methods: Two surveys, one provided to autistic individuals and one to parents/guardians of autistic individuals, were developed and disseminated among a sample of convenience using social media and email. Descriptive analysis of the survey responses was undertaken for all respondents. Results: The majority of respondents still live with their parents, and housing options are limited. The majority of autistic respondents stated that employment was funding their housing needs, and the majority of parents/guardians indicated that family funding was the primary source. The majority of autistic adults wanted to live independently. A clear dichotomy was present between parent/guardian responses and autistic adult responses. Conclusions: The data received from the survey provide evidence that appropriate housing options for autistic individuals in Utah have been and continue to be an ongoing struggle. There are many individual organizations trying to offer

solutions, but working together to synthesize research, outcomes, and lessons learned is imperative to finding optimal housing support for adults on the autism spectrum.

Title: Behind the Wall: Climate Change, Global Security, and Border Militarization

Author: Aidan Reed

Affiliation: Southern Utah University

Abstract: Throughout the world, regions and nations struggling with existing instability are further strained by the effects of climate change. This paper discusses the global security dimensions of climate change and the role of climate change in driving border militarization. I begin by analyzing conflict case studies from around the world, their specific vulnerabilities to climate change, how climate impacts exacerbate existing instability there, and how climate shocks relate to the broader trend of global border militarization. I find that climate shocks are felt unequally, often affecting vulnerable regions and populations that bear the least responsibility for greenhouse gas emissions. Going forward, I expect that climate impacts will continue to contribute to instability in climate vulnerable locations and will continue to influence nations' decisions to militarize their borders and securitize their resources.

Title: Forgive Me Father For My Children Have Sinned: Religiosity, Intrusive Parenting, and Attachment Styles

Authors: Michael J. Guynn, Sarah Prince, Abbi Covington, & Dannelle Larsen-Rife

Affiliation: Dixie State University & University of Minnesota

Abstract: Attachments between children and their caregivers are formed early in life and influence attachment throughout the lifespan (Bowlby, 1969). An anxious attachment style is characterized by an inability to regulate one's own emotions (Ainsworth et al., 1978). Intrusive parents use high degrees of psychological control, are overinvolved in the lives of their children, and do not prioritize autonomy in their parenting (Erickson et al., 1985; Barber, 1996). Intrusive parenting predicts anxious attachment (Kagen et al., 2009; Rubin et al., 2009). People create attachments to God as another means of emotional regulation (Beck & McDonald, 2004). Strict religious ideologies create an atmosphere of high interpersonal guilt and social pressure which may promote intrusive parenting (Albertsten, Connor, & Berry, 2006; Thiruchselvam et al., 2017). It is hypothesized that religious affiliation is associated with intrusive parenting and anxious attachment in Utah residents. Results from regression analysis will be presented.

Keywords: Religion, anxious attachment, intrusive parenting, Utah, LDS church, attachment

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