Independent Colleges and Universities of New Jersey

2024

Undergraduate

Research Symposium

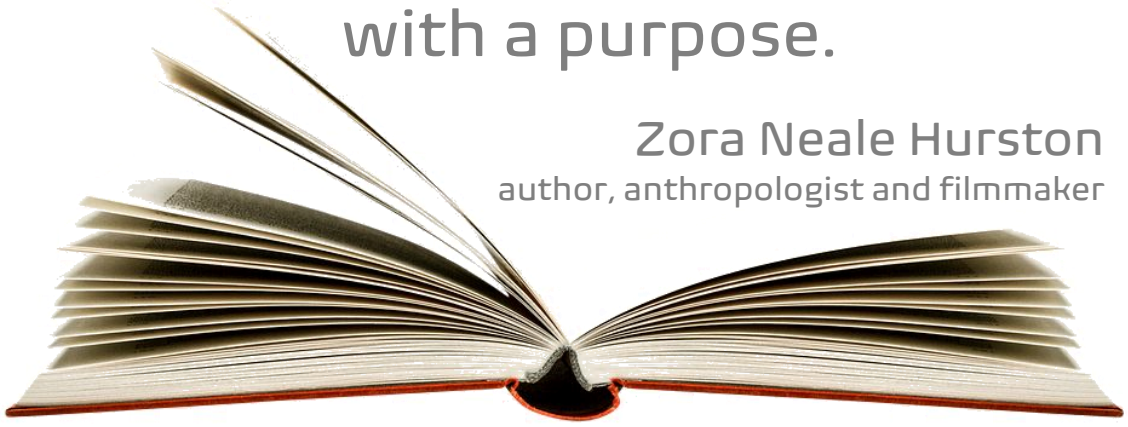
strengthening communication, critical thinking and technical skills

March 19, 2024

Bell Works
Holmdel, New Jersey

Research is formalized curiosity. It is poking and prying with a purpose.

Zora Neale Hurston
author, anthropologist and filmmaker



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and a special thanks for providing
space that inspires the next community of innovators

Bell Works

On behalf of the students who benefit from participation in the Undergraduate Research Symposium, thank you. Your support has provided access to research opportunities emphasizing exploration and innovations in Science, Technology, Engineering, and Math (STEM) fields. The research experience is transformative for students bridging the gap between students' interests, classroom knowledge, and real-world applications. The intersection of these key elements promotes retention in STEM majors and development of critical thinking skills for application in future endeavors.

THANK YOU

Undergraduate Research Symposium

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Every piece of the puzzle that doesn't fit gets you closer to the answer.

-- Cynthia Lewis

Undergraduate Research Symposium

WELCOME MESSAGE

Welcome to the annual Independent Colleges and Universities of New Jersey's Undergraduate Research Symposium.

Over ten years ago, ICUNJ introduced the Undergraduate Research Symposium with the goal of reinforcing a student's choice to pursue a science, technology, engineering or mathematics (STEM) major and to encourage degree completion in a STEM field. Over time, the Symposium has come to represent more than an opportunity for students to pursue their passions in the lab, plan for and engage in innovative research, or work as part of a team. The Symposium applauds the students' research while acknowledging that excellent efforts can be lost if the outcomes are not shared effectively and meaningfully. Today, students will demonstrate that they have mastered both their research and their ability to bring the value of their work to life before our judges.

I encourage you to take the time to read through the Symposium Journal. As you turn each page, you are exposed to the diverse interests of today's ICUNJ students who stand ready to take on the healthcare, environmental and societal issues challenging our communities. Each abstract represents countless hours spent in the reviewing documents in the library and online, enhancing skills by conducting hands-on research in the lab, and participating in discussions with peers and professors. Research is a matter of 'trial and error' and therefore does not always yield the desired results but it always contributes to a student's resiliency, creative thinking, and decision-making skills. Students gain from the learning experience, no matter the outcome. Their learning is guided by faculty members who invest the time and experience in each student's efforts. As a research advisor, they contribute to the transformational student experience that comes from both the successes and disappointments that such research returns. ICUNJ is appreciative of the commitment, guidance and support provided by the faculty.

The Symposium offers a unique opportunity for professional development because of the generosity of our industry and academic judges who share their time, knowledge and experience with our students in presentation sessions. The judges' scores from the sessions may not contribute to a student's GPA, but they serve as critical feedback from which students can gain insight into their strengths and identify areas requiring additional development. The numeric scores and written comments become a personal resource for graduate school and career interviews.

The Symposium would not be possible without our sponsors who share in the commitment to strengthen the STEM pipeline in New Jersey By funding the Symposium, our supporters demonstrate an appreciation for the key role our member colleges play in preparing students for a career and/or advanced study in STEM fields. The impact of these combined investments will be realized over the course of careers from research labs and conference rooms to environmental sites and health care facilities for years to come.

On behalf of the Board of Advisors, allow us to express our gratitude to everyone who has contributed to the success of the Symposium, especially our hosts at the remarkable and historic Bell Works facility.

JACK CALLAHAN
Chair, ICUNJ Board of Advisors

STEVE REYNOLDS
President, ICUNJ

2024 Undergraduate Research Symposium

strengthening communication, critical thinking and technical skills

EVENTS OF THE DAY

Student Researchers and Presentation Judges Arrive	9:00 AM
Opening Program Welcome – Steve Reynolds, President, ICUNJ Speakers – Priya Varma, Director HR Strategic Initiatives, PSEG Services Corp. Tara Fosbre, Vice President, Head of Technology Experience, Guardian Life Insurance Company of America Thierry Klein, President, Nokia Bell Labs Solutions Research Setting Expectations for the Day – MaryAlice Breuninger, Vice President, ICUNJ	9:45 AM
Poster Presentations* Morning Session *Judges, please plan to conduct multiple interviews in each session. Complete presentation assessment forms for one project and hand in at the Registration Table before moving on to next interview. Thank you.*	10:30 AM
Group Photos Students and Judges | Groups by Institution	11:25 AM
Lunch Break	11:40 AM
Poster Presentations* – Afternoon Session *Judges, please plan to conduct multiple interviews in each session. Complete presentation assessment forms for one project and hand in at the Registration Table before moving on to next interview Thank you.*	12:15 PM
Presentation Sessions Wrap UP Final evaluation forms to be submitted at Registration Table.	1:05 PM
Closing Session and Recognition of Top Performers TED Talk "*The Scrapper*" - Regina Hartley, UPS (YouTube)	1:15 PM
Final Remarks Thank you – Safe Home	1:45 p.m.

Photographs

Our photographer will be taking pictures throughout the early presentation session capturing interactions between students and judges. Separate photos will be taken of each presenter(s) with their poster. A link will be provided for accessing the images to all registered participants.

Frank Manning

PHOTOGRAPHY BY FRANK MANNING

Undergraduate Research Symposium

BEYOND THE RESEARCH

By offering the Undergraduate Research Symposium, the Independent Colleges and Universities of New Jersey (ICUNJ) seeks to engage and retain students in STEM majors; prepare students for career and graduate study by enhancing knowledge and skills; introducing students to the variety of careers available to STEM graduates; and by defining career success in multiple ways.

"STEM related education and training seeks not only to develop expertise and capability in each individual field, but also to develop the ability to work across disciplines and generate new knowledge, ideas and products through interdisciplinary learning."

Research grant awardees and ICUNJ administered scholarship recipients conducting research are offered opportunities to participate in the Symposium. Additional students may participate as space allows. The hands-on research experience is augmented by the opportunity to interact with professionals from New Jersey's industry leaders during the one-day symposium. Each presentation is judged by multiple professionals who provide feedback on research abstracts, visual resources, presentation and communication skills. The Symposium also offers an opportunity for peer and career networking.

Beyond the research experiences, which encourage collaboration, foster problem solving and perseverance, the Symposium provides students with feedback to assist them in developing the "power" skills that will be assets in the future.

maintaining the STEM pipeline	The most cost-effective strategy for increasing the supply of STEM workers for the U.S. economy is to reduce college student attrition in STEM fields. Recent findings indicate that students who have the opportunity to engage in research are 121% more likely to persist in a STEM major. (Why don't students tick with STEM degrees? January 11, 2023 post by Stevens Institute of Technology.)
fostering deep learning	The 21st-century classroom has emerged and the standard themes seen in the past are evolving. Students are becoming free to create their own research questions; work with collaborative groups; conduct their own experiments, make mistakes, and learn from them; and even draw connections between multiple subjects. *(The Immediate Value of STEM Education, Carmody, January 2016)*
creating problem solvers	Empirical research by Meyrick has shown that STEM education provides students with a "systemic approach" to solving the unknown. Providing students with a clear path to investigate problems gives students the freedom and confidence to form a conclusion on their own. *(The Immediate Value of STEM Education, Carmody, January 2016)*
building confidence	According to DRPF Consults, STEM education teaches students how to learn and provides students with a valuable skill that will never leave them – confidence. Instead of telling a student that they are right or wrong, STEM education enables a student to become a lifelong learner in which they have the confidence to find an answer for his or herself. *(The Immediate Value of STEM Education, Carmody, January 2016)*
exploring career options	Affording students the opportunity to interact with industry professionals during the Symposium exposes students to the myriad of career opportunities available to them in STEM fields and demonstrates that career success is defined in multiple ways. The experience provides students access to professionals who can provide positive, real-life contact to STEM careers making them more accessible. *(Siemens Foundation, 2013)*
developing soft skills	A common complaint among employers is that young people do not know how to effectively carry on a conversation and are unable to do things like ask questions, listen actively and maintain eye contact. At the Symposium, students engage in a series of judged presentations and receive performance feedback to aid in development of these skills.

Independent Colleges and Universities of New Jersey
A New Jersey Nonprofit Corporation

New Jersey ICUNJ Education State

Independent Colleges and Universities of New Jersey (ICUNJ), a New Jersey Non-Profit Corporation, strives to advance the New Jersey's independent, non-profit, public mission institutions of higher education by promoting access, affordability and student success through public policy advocacy, corporate and individual philanthropy, and empowering the choice of the best fit for each student's educational, cultural, and environmental needs.

ICUNJ represents a diverse set of private, nonprofit higher education institutions and the students who choose independent higher education as an opportunity for educational equity, career possibilities and economic mobility - Caldwell University, Centenary University, Drew University, Fairleigh Dickinson University, Felician University, Georgian Court University, Monmouth University, Princeton University, Rider University, Saint Elizabeth University, Saint Peter's University, Seton Hall University, and Stevens Institute of Technology.

ICUNJ creates partnerships with industry leaders to enhance college pathways giving students the option to choose the college experience that best offers the greatest chance for success; reinforces the factors that contribute to student success – persistence, educational attainment, academic achievement, student advancement and holistic development; and establishes experiential learning encounters that give students a fuller perspective of career options and insight into the necessary skills and knowledge for entering a field. ICUNJ also invests in efforts that elevate awareness of the value of a college education for students, community and workforce. It depicts the myriad of ways a college education contributes to the quality of life by fostering strength in community development, intellectual depth, cultural diversity. and artistic exposure.

S U C C E E D

L I V E

E A R N

J

Explore the exciting college options at New Jersey's independent colleges & universities

LIVE

A recent WalletHub survey ranked New Jersey as the best place to live in the nation. New Jersey offers natural beauty in its mountains, farmlands and shores. Access to cultural opportunities exist within its own borders and are bolstered by short commutes to the major metropolitan centers of New York and Philadelphia.

Job opportunities with 15 Fortune 500 companies are headquartered in the State and a broad range of industries opportunities with well established businesses and innovative start-ups can be found for career alternatives.

LEARN

Among our independent colleges and universities there are opportunities for students to pursue their interests and academic choices. Students will find at our institutions the proven benefits of small to mid-sized higher educational institutions: coursework can be adapted to fit class; more hands-on and engaging assignments; encouragement of students participation; students receive more instructor feedback; and more opportunities to learn from peers.

Our colleges work to make college accessible and affordable. The independent colleges in New Jersey seek to extend the benefits of higher education to people from all walks of life and income levels.

SUCCEED

New Jersey has the highest average income among all 50 US states, according to World Population Review. A key reason is the high educational attainment and 4-year graduation rates of our state's students which are both ranked among the top 5 in the United States by US News and World Reports.

in NEW JERSEY

Undergraduate Research Symposium

MEET THE SPEAKERS

Priya Varma, Director HR Strategic Initiatives, PSEG Services Corp.

Priya Varma is the Director of Strategic Initiatives for PSEG since 2021 where she has functional responsibility for Strategic Diversity Sourcing, Talent Acquisition Strategy and University Relations across the PSEG Enterprise. Priya, in her current role, also supports shaping the Enterprise strategy for the Company's human capital management programs.

Priya has performed a variety of roles since joining the company in 2010. Prior to her current role, she served as Manager of Talent Strategy providing support in the areas of Enterprise-wide talent strategy, human capital management, and succession analytics. She previously served as the Manager of Compensation and Analytics where she focused on providing support in the areas of benchmarking, metrics, and advanced analytics. Prior to that, she served in a Performance and Reporting Manager role, and as Analyst for PSE&G.

Prior to joining PSEG, Priya held analyst role in Johnson & Johnson and Hibbert Ground.

A 2018 graduate of PSEG GROW (Growing and Reaching for Opportunities for PSEG Women) program, Priya also is a certified Project Management Professional (PMP). Priya earned a bachelor's degree in economics from Patna University, India and Post Graduate Diploma in Finance from the Symbiosis University, India

Tara Fosbre, Vice President, Head of Technology Experience, Guardian Life Insurance Company of America

She is currently responsible for shaping the Technology workforce of the future. Early Career and Women in Technology are her passion projects and in this role she is able to marry her leadership experience with her passion. Prior to this she drove many of the early Digital initiatives in support of new business objectives, most recently Direct To Consumer.

Ms. Fosbre has significant experience with innovative solutions across insurance and media industries. Her experience has helped drive change and thinking at Guardian enabling them to innovate and evolve our products to have more customer focus.

Prior to joining Guardian, Ms. Fosbre was Director of Mobile Development at Dow Jones, where she had responsibility for creating and supporting their suite of mobile applications; WSJ, Barron's, NY Post, Market Watch, FXTrader and Factiva. Prior to that, she was Sr. Manager at MTV, where she led the implementation and network roll out of a new deal and ad sales planning system. Prior to that she started her career at Chubb Insurance Company, where she held many roles in technology learning from the ground up. She credits her current success to the strong foundation she learned while at Chubb.

Ms. Fosbre earned her Masters from Stevens Institute of Technology. In her spare time, she is an avid boater and enjoys fishing.

Undergraduate Research Symposium

MEET THE SPEAKERS

Thierry E. Klein, President, Nokia Bell Labs Solutions Research,

Thierry's distinguished global multi-disciplinary team conducts fundamental and applied research focused on new value chains, business opportunities and ecosystems beyond Nokia's current product and solutions portfolio. His team pursues research and innovation into advanced sensing technologies, AI-based knowledge systems and fundamental algorithms, autonomous software and data systems, novel architectures and integrated solutions and experiences.

Thierry served as the Founding Vice-Chair of the Board of the 5G Automotive Association, a cross-industry association bringing together the telecommunications and automotive industries, and he served as the Chair of the Technical Committee of GreenTouch, a global consortium dedicated to improving energy efficiency in networks by a factor 1000x compared to 2010 levels. He was the Founder and CTO of an internal start-up focused on wireless communications for emergency response and disaster recovery situations.

Thierry earned an MS in Mechanical Engineering and an MS in Electrical Engineering from the Université de Nantes and the Ecole Centrale de Nantes in Nantes, France. He received a PhD in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology, USA. He is an author on over 35 peer-reviewed conference and journal publications and an inventor on 36 patent applications. In 2010, he was voted "Technologist of the Year" at the Total Telecom World Vendor Awards and received the 2016 Industrial Innovation award from the IEEE Communications Society.

Thierry has dual US and Luxembourg citizenship and speaks four languages.

TED Talk – "Why the Best Hire Might Not Have the Perfect Resume"

Regina Hartley, Vice President, Global Talent Management, UPS

Throughout her 25-year UPS career – working in talent acquisition, succession planning, learning and development, employee relations, and communications – Regina Harley has seen how, given the opportunity, people with passion and purpose will astound you.

Today, Hartley started with UPS as a Systems/Business Analyst in October 1989. By accepting challenges, working hard, and committing to learning as a lifelong pursuit, she has advanced her career with UPS to where she provides direction and leadership for talent management around the world.

She holds a BA in political science from SUNY Binghamton and an MA in corporate and organizational communication for Fairleigh Dickinson University. She is a certified Senior Professional in Human Resources (SPHR) from the HRCI. Hartley served on the ICUNJ Board bringing her HR expertise to Talent Pipeline Development. She was also board chair providing strategic direction during a major organizational transition.

Please watch this inspirational message provided by former chair of the Independent Colleges and Universities of New Jersey Board of Trustees: https://www.youtube.com/watch?v=jiDQDLnEXdA.

NJ Undergraduate Research Symposium

JUDGES ROSTER

Jehoshaphat Aribike
Manager, Laboratory & Testing Services
PSEG

Darryl S. Aucoin, Ph.D.
Associate Professor
Department of Natural Sciences
Caldwell University

Joseph Badillo, Ph.D.
Assistant Professor
Department of Chemistry and Biochemistry
Seton Hall University

Lawrence Berko
Manager, Laboratory and Testing Services
PSEG

Jack Callahan
Retired Partner
CohnReznick, LLP

Alfredo Castro, Ph.D.
Associate Professor
Chemistry and Physical Sciences
Felician University

Mary Ann Clark
STEAM Specialist, Hazlet Township Schools
Owner of Just STEAMIN LLC

YL Cha, Ph.D.
Assistant Professor of Biology
School of Natural, Health, Social
and Behavioral Sciences
Centenary University

Susanna Chiu
Senior Director of Operational Services
PSEG

Jessica Cottrell, Ph.D.
Associate Professor of Biological Sciences; Chair
Department of Biological Sciences
Seton Hall University

Jo Ann Cummings, Ph.D.
Associate Professor
Hackensack Meridian Health School of Nursing
Georgian Court University

Michael Danko
Business Development Manager
Pennoni

Amanda Del Bene
Managing Director
Public Finance Investment Banking
Raymond James & Associates, Inc.

Monica Dema
Founder and President
Mdema, Inc.

Tara Fosbre
Vice President
Head of Technology Experience
Guardian Life Insurance Company of America

Brian Gao
Industrial and Systems Engineer
Artillery Munitions Quality Branch
US Army, DEVCOM Armaments Center,
Picatinny Arsenal

We must find time to stop
and thank the people who
make a difference
in our lives.
~ John F. Kennedy

t h a n k y o u

NJ Undergraduate Research Symposium

JUDGES ROSTER

Xiaolei Gao, Ph.D.
Associate Professor of Chemistry
School of Natural Sciences
Caldwell University

Rachel Guether
Senior Director,
Global Supply Chain Project Leader
Pfizer

John J. Guers, Ph.D.
Assistant Professor
Department of Biology,
Behavioral Neuroscience & Health Sciences
Rider University

Edgardo Guillen, M.S.
Associate Technology Engineer
DBA at PSEG

Erik Hill, Ph.D.
Assistant Professor
Department of Biological Sciences
Seton Hall University

Amine Houyou
VP Bell Labs
Integrated Solutions in Automation and Digital Twins
Nokia Bell Labs Solution Research

William Huamani
Senior Program Manager - ISRM
Johnson & Johnson

Thierry Klein
President
Bell Labs Solutions Research
Nokia Bell Labs

Tommy Lobben
Manager, Community Engagement
Johnson & Johnson

Alexander Mandic
Industrial Engineer
Artillery Munitions Quality Branch
US Army, DEVCOM Armaments Center,
Picatinny Arsenal

Austin Mattus
Staff Engineer – 3rd Party Relocation Group
Electric Transmission & Distribution – Projects & Construction
PSEG

Dr. Simone Mays
Breast Surgical Oncologist
Hackensack Meridian Health Network

Christina McKittrick, Ph.D.
Program Director – Department of Neuroscience
Associate Professor of Biology
Drew University

Gina Moran Cleary
Director Retired
Morris Arts

Faith Muriithi
Process Analyst
Renewables & Energy Solutions
PSEG

Jonathan Ouellet, Ph.D.
Assistant Professor
Department of Chemistry and Physics
Monmouth University

thank you

NJ Undergraduate Research Symposium

JUDGES ROSTER

Luisa Palacio Zapata
Mechanical Engineer
Lethal Mechanism Concepts Branch
US Army, DEVCOM Armaments Center,
Picatinny Arsenal

Igor Pikovski, Ph.D.
Professor in Theoretical Quantum Physics
Department of Physics
Stevens Institute of Technology

Peter Russo
Life Science Lead/Account Manager
New Jersey Manufacturing Extension Program, Inc.

Bob Schmouder
Translational Medicine Head, Clinical Ex
Novartis Biomedical Research

Jonathan Trexler
Associate Director of Innovation, Surgery R&D
Biodesign Leader
BD

Laura Twersky, Ph.D.
Professor
Department of Biology
Saint Peter's University

William A. Velhagen, Jr, Ph.D.
Pre-Professional Advisor, Professor of Biology, and
Associate Dean - School of Natural Sciences
Caldwell University

Weidong Zhu, Ph.D.
Dean, Colleges of Arts & Sciences
Professor Physics, Department of Applied Science
and Technology
Saint Peter's University

Haiyan Zhao
Area M & V Manager
Johnson Controls

Never regard study as a duty, but the enviable opportunity to learn.

- **Albert Einstein**

thank you

NJ Undergraduate in STEM Research Symposium

SYMPOSIUM PRESENTERS

Project

1 **Ishaq Ansari, '25 –** Caldwell University
Prussian Blue (PB): From Artist's Palette to a Promising Solution for Recovering Precious Metals from Electronic Waste

2 **Gyedi Appiah-Pipim, '24 –** Drew University
Possible Synthesis of Samarium Diiodide Using CPME

3 **Alysha Bailey, '24 –** Saint Elizabeth University
Application of UV spectrophotometric method for easy and rapid estimation of 6-Mercaptopurine in commercial bulk and pharmaceutical formation

4 **Vanesa Barragan-Luna, '25; Mackenzie Scott, '25 –** Rider University
Difference in the Glucose Tolerance Test (GTT) in C57BL/6J and BALB/cJ mice

5 **Essowedeou Jeremie Botobikpissi, '25 –** Saint Peter's University
Classification Algorithm on a Quantum Computer

6 **Julianna Bruzzese, '24 –** Stevens Institute of Technology
Novel Mouse Models for Studying Kidney Cancer

7 **Ashley Buchman, '24; Thomas Morris, '24 –** Centenary University
Investigating Water Quality in Interconnected Bodies of Water in Northern New Jersey

8 **Deirdre Campbell, '24 –** Monmouth University
Isolation of an Aptamer Selective to Glucose

9 **Kenia Castellanos, '24 –** Saint Peter's University
The Effects of Polystyrene, Bisphenol A, and Bisphenol X, Individually and In Combination, on Larval Amphibian Tail Regeneration

10 **Alex Cobian-Soto, '24 –** Caldwell University
Understanding Antibiotic Resistance: Assessing Antifungal Agents on *Candida* Species

11 **Alfredo Di Paola, '24 –** Seton Hall University
Immobilized fluorinated nickel phthalocyanines on solid-state supports

12 **Sahil D'Souza, '26 –** Seton Hall University
Photoacid Generator Catalysis for Conjugate Addition Reaction

13 **Michael Eckel Santos, '24 –** Seton Hall University
Photocatalytic degradation of malathion

14 **Maria Juanita Franco, '26 –** Centenary University
Comparative Analysis of Anxieties: Impact of Social Isolation vs. Social Interaction in Hamster model.

15 **Isabella Furrick, '24 –** Stevens Institute of Technology
Designing Nickel-Platinum Bimetallic Catalysts for Fuel Cell Applications Using Machine-Learned Interatomic Potentials

NJ Undergraduate STEM Research Symposium

SYMPOSIUM PRESENTERS

Project

16 **Jayden Heron, '26 –** Caldwell University
Green Recovery of Silver form S-Ray Films and Photographic/S-Ray Fixer Waste

17 **David Hoyt, '24 –** Drew University
Investigating the Innate Immune Response to Double Stranded and Single Stranded DNA Viruses

18 **Hadia Tul Iman, '25; Ratiba Megalla, '25 –** Saint Peter's University
Effects of Microplastics/Endocrine Disrupters on Skeletal Development

19 **Aditya Kasina, '26; Marco Fanik, '26 –** Seton Hall University
Effect of Orthosilicic Acid and Cholecalciferol on MC3T3 Osteoblast Cells under High TNF-a Treatment Simulating Inflammatory Diabetic Conditions

20 **Jay Khandelwal, '24 –** Drew University
Isolation of decoyinine-resistant mutants of *Bacillus subtilis* that increases the production of guanosine triphosphate (GTP), a precursor of riboflavin (vitamin B2) biosynthesis.

21 **Olivia Kondroski-Marion, '24 –** Centenary University
Blood Clotting Time Differential Based on Phenotype

22 **Brad Mahoney, '24 –** Saint Elizabeth University
Analyzation of the Interaction of an FDA Approved Anti-Cancer Drug 6 Mercaptopurine (6-MP) with Calcium (Ca^{+2}) A study Using UV Spectroscopy

23 **Christopher Miranda, '25; Joseph Sauchelli, '24 –** Georgian Court University
Effects of Resistance Exercise Training on Muscular Fitness and the Correlation Between Endurance Capacity and Agility in Division-II Collegiate Soccer Players

24 **Barbara Munoz, '25; Carlos Duque Sanchez, '25 –** Saint Peter's University
Effects of selected microplastics and endocrine-disrupting chemicals, on the cardiovascular system of *Xenopus laevis (*clawed frog)

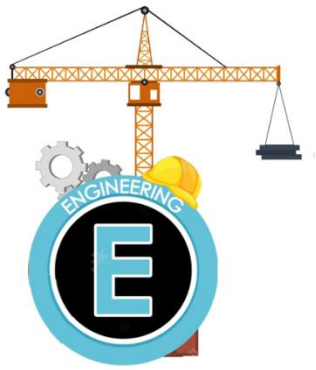
25 **Harris Naqvi, '24 –** Drew University
The Effects of Environmental Stress on a Mouse Model of ADHD

26 **Alyssa Negron, '24; Marion Haroun, '25 –** Caldwell University
A Greener Route to the Synthesis of Antidepressant (S)-Duloxetine (Cymbalta)

27 **Pamela Nolasco, '24 –** Caldwell University
Cochineal Red as a pH-Responsive Food Freshness Indicator, a New Destiny for the Bugs to Dye for

28 **Julianna Orlando, '26 –** Georgian Court University
Establishment and response of the gut microbiome of *Caenorhabditis elegans* to pharmaceuticals and personal care products

29 **Camellia Ouhadj, '25 –** Caldwell University
Investigating Antimicrobial Surgical Attire Fabrics to Mitigate Staphylococcus aureus Proliferation



NJ Undergraduate STEM Research Symposium

SYMPOSIUM PRESENTERS

Project

30 **Evan Papageorge, '26 –** Stevens Institute of Technology
Cultural Epochs and Societal Shifts: Insights from Literature, Music, and Art

31 **Olivia Parlow, '24 –** Stevens Institute of Technology
Medical Decision-making

32 **Alexis Pope, '24 –** Stevens Institute of Technology
Machine Learning and AI-Driven Design and Synthesis of Metabolically Stable Analogs of Pfizer COVID 19 Compound (Nirmatrelvir)

33 **Danilo Rocenovic, '25; Shereen Hannah, '25; Katherine Sanchez, '25 –** Saint Peter's University Effects of Microplastic Components, Individually and in Combination, on Neurodevelopment in *Xenopus laevis* (clawed frog)

34 **Ciara Rodriguez, '24 –** Centenary University
The Implications of the Stigma Surrounding Schizophrenia

35 **Helena Sargeant, '25 –** Centenary University
Hamster Anxiety, Memory, and Social Interaction Connections

36 **Harris Satti, '25; Vedant Prajapati, '24 –** Saint Peter's University
Electrochemical Analysis of Ru-Immobilized Water-Splitting Catalysts for Clean Energy Production

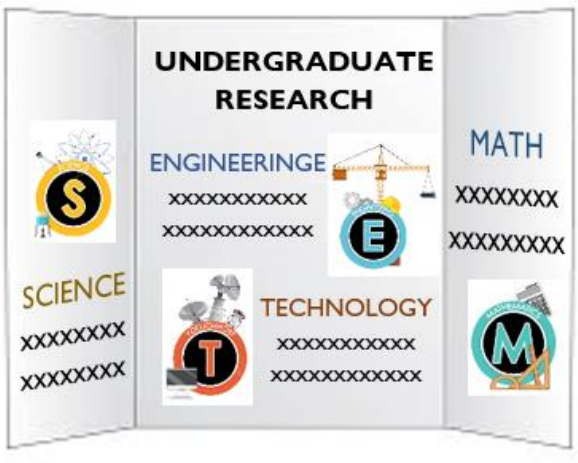
37 **Johnnell Solomon-Webb, '24 –** Felician University
UV Spectrophotometry of Artificial Sweeteners

38 **Gabriel Sorci, '25 –** Stevens Institute of Technology
Quantum Atomic Clocks and Time Dilation

39 **Liza Sukhija, '26 –** Fairleigh Dickinson University
Artificial Intelligence Application for Real World: Pima Indian Diabetes Dataset

40 **Jamani Thompson, '25 –** Caldwell University
Determining the Concentration of Potassium and Vitamin B6 in Conventional and Organic Bananas

41 **Sophia Wayner, '25; Nicolas Radovanic, '25 –** Centenary University
A New Meaning to Bird Brain: Chicken color and shape associative learning



The success of your presentation will be judged not by the knowledge you send but by what the listener receives.

~ Lily Walters

Independent Colleges and Universities of New Jersey
2024 Undergraduate Research Symposium
strengthening communication, critical thinking and technical skills

PROJECT 1

SECOND PLACE AWARD

ISHAQ ANSARI

Caldwell University, Class of 2025
Major: **Biology, Computer Science**
Minor: **Chemistry**

Faculty Advisor: **Dr. Xiaolei Gao,** Associate Professor of Chemistry
School of Natural Sciences

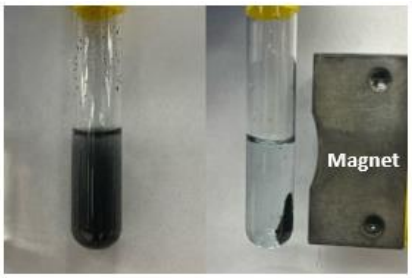
Prussian Blue (PB): From Artist's Palette to a Promising Solution for Recovering Precious Metals from Electronic Waste

According to the Global E-waste Monitor, over 59 million tons of electronic waste was dumped in landfills in 2019 alone, with an estimated $57 billion worth of gold, silver and other recoverable metals being wasted. Meanwhile, the demand for these precious metals is growing exponentially due to technological advancements, making it crucial to explore practical methods to recover and reuse these metals from e-waste.

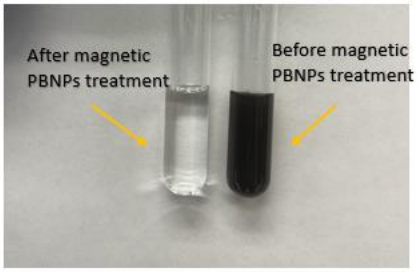
Prussian Blue (PB), the brilliant blue pigment that once revolutionized the world of art, has found many new applications due to its ability to trap metals. Our research aimed to develop an efficient way to prepare and purify magnetic Prussian blue nanoparticles (PBNPs) and use them to recover precious metals from e-waste.

We first studied the synthesis of PB pigment and its application to cyanotype print. We then investigated PB's ability to absorb heavy metal and recover precious metals. After synthesizing PB by mixing iron (III) chloride and potassium hexacyanoferrate, we harvested the precipitate through sedimentation, centrifugation, and filtration, all of which proved to be time consuming. To enhance efficiency, we bound PB to a core of magnetite nanoparticles, creating magnetic PBNPs. The binding of PB and magnetite was confirmed using Infrared Spectroscopy. Introducing Magswitch, a powerful magnetic device that can be turned on and off with a simple half turn of a knob, we accelerated the separation process exponentially. We tested the ability of magnetic PBNPs to trap lead in water and discovered that magnetic PBNPs effectively adsorbed the lead. Further investigation of magnetic PBNPs as a solution to recover precious metals such as gold and palladium in e-waste is under way.

A recreation of "Great Wave Off Kanagawa" using Cyanotype (Sun Print) in our lab



Magnetic Prussian Blue



Sulfide Test for Lead-containing Water

Independent Colleges Undergraduate Research Award Recipient 2024

Independent Colleges Scholarship Award: ***Novartis Science Scholarship 2023-24***

Additional Funding: Caldwell University Independent Research Program

Acknowledgments: Dr. William Velhagen of Caldwell University

Independent Colleges and Universities of New Jersey
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PROJECT 2

GYEDI APPIAH-PIPIM

Drew University, Class of 2024
Major: **Chemistry**
Minor: **Biology**

Faculty Advisor: **Dr. Kimberly Choquette,** Assistant Professor
Chemistry Department

Possible Synthesis of Samarium Diiodide Using CPME

Samarium diiodide (SmI2) is a single electron reductant that can be used to create carbon- carbon bonds or other synthetic transformations. SmI2 is air and moisture sensitive, so it is made and used in an argon filled glove box, or with air-tight glassware known as a Schlenk line. Previous work in our lab has shown that the most impactful part of a successful use of SmI2 is the dryness of the THF solvent. Freshly distilled THF will still slowly accumulate moisture when stored on the Schleck line and therefore there is a certain limit before THF does not adequately synthesize the SmI2 reagent. With this insight we are exploring other solvents that could be used to make the soluble SmI2 reductant but is less prone to watch uptake. Initial work has been started with Cyclopentyl methyl ether (CPME) is a possible replacement solvent, as it can be dried with molecular sieves alone, removing the need to distill the solvent or to have a drying solvent system in the lab. Initial results on the synthesis and use of SmI2 with CPME are analyzed with an acetophenone reduction. The first four acetophenone reduction results have an average of 74.75% conversion.

Independent Colleges Undergraduate Research Award Recipient 2024

Acknowledgments: Kimberly Choquette, Assistant Professor; Mary-Ann Pearsall, Professor; Adam Casano, Associate Professor

ALYSHA BAILEY

Saint Elizabeth University, Class of 2024
Major: **Biochemistry**
Minor: **Mathematics**

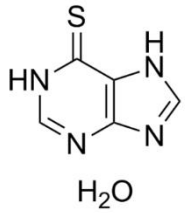
Faculty Advisor: **Dr. Bidisha Banerjee,** Assistant Professor of Chemistry and Biochemistry
Chemistry Department

Application of UV spectrophotometric method for easy and rapid estimation of 6-Mercaptopurine in commercial bulk and pharmaceutical formation

The purpose of this research project was to devise a novel and efficient method to quantify and validate FDA approved anti-cancer drug 6-mercaptopurine (Figure 1) formulations utilizing UV- VIS spectrophotometry. The following methodology was used: A 5 mg/ml 6- MP pure drug stock solution in dimethyl sulfoxide (DMSO). Subsequent dilutions were performed to determine the optimal linear concentration ranges such that absorbance was below 1.0.

The linear range for absorbance values was found to be 2.5-5 µg/ml after multiple rounds of trial and error starting with 50 - 100 µg/ml and then 5-10 µg/ml, culminating in absorbance values less than 1 in the 2.5 - 5µg/ml. The absorbance values for all 6- MP solutions were read between 200-400 nm and absorbance maxima was recorded at a wavelength of 323.7 nm (Figure 3).

Using the above-mentioned data, a calibration curve (Figure 2) was obtained. Right now experiments are underway to quantify the drug in the 6- MP formulation from Hykma pharmaceuticals using spike and recovery methods. Further investigation and adjustments to the methodology for quantification is going on. The final results table will be presented at the symposium.



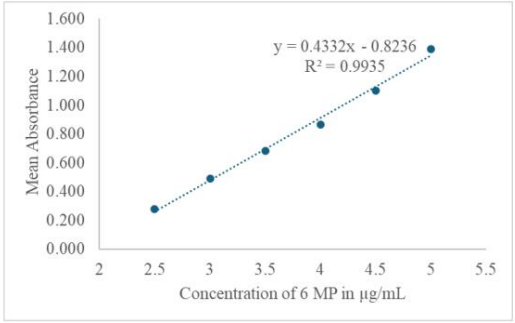


Figure 2: Calibration Curve

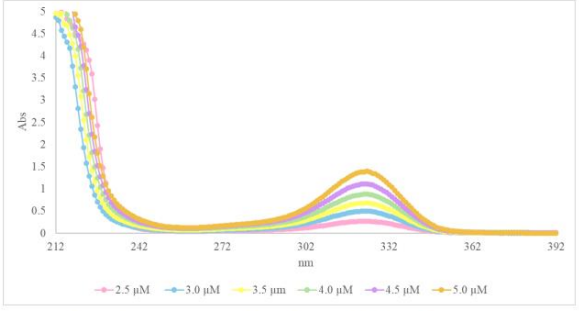


Figure 3: Overlay figure of linearity ranges of 6-Mercaptopurine (2.5–5.0 µg/ml)

Independent Colleges Undergraduate Research Award Recipient 2024

Independent Colleges Scholarship Award: ***Novartis Science Scholarship 2023-24***

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PROJECT 4

THIRD PLACE AWARD

VANESA BARRAGAN-LUNA
Rider University, Class of 2025
Major: **Biochemistry**

MACKENZIE SCOTT
Rider University, Class of 2025
Major: **Biology**

Faculty Advisor: **Dr. Todd Weber,** Professor
Department of Biology,
Behavioral Neuroscience and Health Sciences

Difference in the Glucose Tolerance Test (GTT) in C57BL/6J and BALB/cJ mice

Previous studies reveal that BALB/cJ mice appear to have higher glucose tolerance compared to C57BL/6J mice in the IPGTT, as indicated by a smaller spike in blood glucose levels and a quicker return to baseline following an intraperitoneal glucose injection. The mechanism behind this seemingly higher glucose tolerance is unknown, leading us to question whether the IPGTT is a reliable indicator of glucose tolerance in the BALB/cJ mice. To differentiate between the intraperitoneal GTT discrepancies, an intravenous GTT and an insulin sensitivity test were conducted in order to determine the factors responsible for the apparent higher glucose tolerance of the BALB/c mice. An intravenous GTT was then used to validate whether intraperitoneal GTT is a good measure of glucose tolerance, as it bypasses the need for abdominal absorption. Performing the IVGTT in restrained mice has been proven difficult, leading us to consider the use of the anesthetic known as avertin. However, conducting a GTT with avertin revealed borderline hyperglycemic effects (two-tail t-test, $p = 0.104$). Completing the IVGTT without avertin indicated that the BALB/cJ mice are more efficient than C57BL/6J at regulating blood glucose level (BGLs) (two-tail t-test, $p = 0.0148$). To explain this greater glucose tolerance, we performed an insulin sensitivity test (IST). The IST results indicated that the C57BL/6J mice are equally sensitive to insulin as the BALB/cJ mice (two-tail t-test, $p > 0.05$), as indicated by a comparable level of glucose removal from the bloodstream after an injection of insulin. Alternative explanations might involve greater insulin secretion in the BALB/cJ strain, or non-insulin dependent mechanisms related to metabolism including glucose effectiveness.

Independent Colleges Undergraduate Research Award Recipienst 2024

Acknowledgments: Additional support provided by Dr.Riggs with the IVGTT.

ESSOWEDEOU JEREMIE BOTOBIKPISSI

Saint Peter's University, Class of 2025
Major: **Cybersecurity**
Minor: **Math**

Faculty Advisor: **Dr. Rebecca Conley,** Associate Professor
Department of Mathematics and Statistics

Classification Algorithm on a Quantum Computer

Quantum computing and machine learning are two rapidly developing fields of study. Quantum computing has the potential to address the so-called curse of dimensionality, which can arise in machine learning as datasets grow ever larger. One area of machine learning is classification, where the supervised learning model tries to predict the correct label (or class) of some input data based on the classification of the training data.

In this research project, we aim to explore the potential of quantum computing for classification tasks in machine learning by reproducing the classifier in *Implementing a distance-based classifier with a quantum interference circuit* by Schuld, Fingerhuth, and Petruccione, and apply the algorithm to a different benchmark problem, so as to assess the performance of the algorithm. The data must be prepared on a classical computer before running the algorithm on a quantum computer, and the challenges of this are explored.

JULIANNA BRUZZESE

Stevens Institute of Technology, Class of 2024
Major: **Biology**
Minor: **Medical Humanities**

Faculty Advisor: **Dr. Ansu Perekatt,** Assistant Professor
Department of Chemistry and Chemical Biology

Novel Mouse Models for Studying Kidney Cancer

Kidney cancer ranks ninth among human cancers and over 14,000 patients succumb to the disease each year. There are a limited number of genetically engineered mouse models of kidney cancer. The majority of patient-derived xenograft models does not mimic the in vivo environment, given that the xenografts are in immunocompromised mice.

To develop a mouse model of kidney cancer, we simultaneously deregulated Wnt and Tgf signaling using a conditionally mutant mouse. It is known that Wnt signaling is associated with cell migration, proliferation, stem cell regeneration and renewal, and apoptosis, and it is also known that dysregulation of this pathway can lead to tumor growth. H&E staining and collagen staining was used to view the structure and compare the wild type with treated mutants, and we have begun performing IHC, in which we utilized the GFP biomarker to determine the presence of stem cells. We found expression of stem cell markers and phenotypic changes suggesting tumorigenic phenotype, and we are currently evaluating the markers associated with tumorigenesis in the kidney by immunohistochemistry.

Independent Colleges Undergraduate Research Award Recipient 2024

Acknowledgments: Thanks to my lab partner **Rohit Patel**, as well as Zahra Hashemi and Shima Nejati

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PROJECT 7

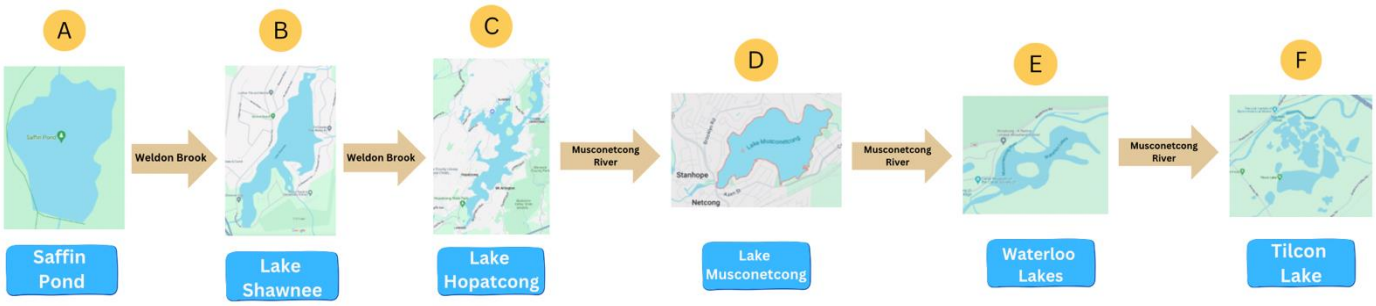
ASHLEY BUCHMAN
Centenary University, Class of 2024
Major: **Forensic Science**
Minor: **Chemistry, Criminal Justice**

THOMAS MORRIS
Centenary University, Class of 2024
Major: **Biology**
Minor: **Chemistry**

Faculty Advisor: **Dr. Mourad Frites,** Assistant Professor of Chemistry
School of Natural, Health, Social, and Behavioral Sciences

Investigating Water Quality in Interconnected Bodies of Water in Northern New Jersey

This study focuses on the flow of water from Weldon Brook through several lakes, including Lake Shawnee, Lake Hopatcong, Lake Musconetcong, Waterloo Lakes, and Tilcon Lake, before eventually reaching the Musconetcong River and the Delaware River. The water quality analysis for each individual body of water, followed by comparisons with all connected bodies, is crucial for understanding the potential impact of upstream water quality on downstream bodies. This project aims to measure and compare water quality in different bodies of water, analyze critical data such as chemical concentrations, and provide valuable information for managing and preventing pollution incidents.



Independent Colleges Scholarship Award: ***Schering-Plough Undergraduate Research 2023-24*** *(Buchman)*

Acknowledgments: Centenary University, Independent Colleges and Universities of New Jersey

DEIRDRE CAMPBELL

Monmouth University, Class of 2024
Major: **Chemistry**

Faculty Advisor: **Dr. Jonathan Ouellet,** Associate Professor
Department of Chemistry and Physics

Isolation of an Aptamer Selective to Glucose

Diabetes is a disease that hundreds of million people live with daily throughout the world. Although this is disease is typically not fatal, it can be if not treated properly. The project at hand works to eliminate the current methods of treating diabetes and ultimately find a cure for the disease. This project uses Systematic Evolution of Ligands by Exponential Enrichment, or SELEX, to select RNA that binds specifically glucose. The process is a cycle beginning with a PCR from a pool of DNA sequences, then transcription to RNA, negative selection, positive selection, and reverse transcription back to DNA. The conclusion of the reverse transcription is the beginning of the next generation where each generation becomes more selective to glucose. Eventually the RNA would be sequenced and converted to a riboswitch. A riboswitch is a sequence of untranslated mRNA that can bind a specific ligand, in this case glucose, and transmit a signal to the expression platform to start the reaction to make a protein. For this project the riboswitch would begin the production of insulin only in the presence of glucose. By making insulin outside of the pancreas, diabetes patients would no longer need insulin injections or constantly monitor their blood sugar levels. The project is currently on its 27th generation and is continuing to move forward. Once we obtain a high ratio of positive over negative cleavage percentages, we will begin the process to clone DNA and individually test sequences to find an aptamer that cleaves only in the presence of glucose.

Independent Colleges Scholarship Award: ***Novo Nordisk Scholar 2022-23***

Additional Funding: Monmouth University Department of Chemistry and Physics

KENIA CASTELLANOS

Saint Peter's University, Class of 2024
Major: **Biology**
Minor: **Chemistry**

Faculty Advisor: **Dr. Laura H. Twersky,** Professor Department of Biology

The Effects of Polystyrene, Bisphenol A, and Bisphenol X, Individually and In Combination, on Larval Amphibian Tail Regeneration

Microplastics (MPs) are an alarming polluting factor in the environment. Common microplastic components are polystyrene (PS), polyethylene, and polypropylene. MPs in addition, concentrate environmental endocrine disruptors like bisphenol A (BPA), a common plastic material. Studies have shown that Bisphenol S (BPS), a replacement for BPA, is not necessarily safer as it has comparable hormonal effects (Rochester and Bolden, 2015). BPA causes toxic effects on regenerating sensory hair cells in zebrafish through oxidative stress and other mechanisms (Hayashi et al., 2014). PS has been shown to inhibit caudal fin regeneration by altering reactive oxygen species (ROS) signaling and immune response (Gu et al., 2020). Whether MPS/EDCs(endocrine-disrupting chemicals) interfere with regeneration in the model organism *Xenopus laevis* (clawed frog) is being investigated. Tadpoles will be exposed to BPA, BPS, and PS, individually and in combination. Tail amputations in Nieuwkoop and Faber stage 48 tadpoles will be done following MS-222 (.2 g/L) anesthesia. Experimental groups are; a.) 5 ug/mL of BPA, b.) 5 ug/mL of BPS, c.) 0.01% solution of PS, d.) 5 ug/mL combination of BPA, BPS, and PS(.01%). e.) 5 ug/mL BPA -tail amputated, f.) 5 ug/mL BPS -tail amputated, g.) 0.01% solution of PS -tail amputated, h.) 5 ug/mL combination of BPA, BPS and PS(.01%) - tail amputated. MPs/EDCs are combined because they mimic how we are exposed to them in the environment. Polystyrene beads are boiled in tap water and a .01% solution will be made from the water they were boiled in. Tadpole tails will be amputated and tail lengths will be measured at specific intervals: a.)immediately after amputation, b.)24 hours after amputation, c.)72 hours after amputation, and d.) 1 week after amputation, and e) 2 weeks after amputation. Tail regeneration occurs within 2 weeks (Sugiura et al., 2004). Photography and construction of survivorship curves will be done. A literature review will be presented on the effects of MPS and EDCs on regeneration.

Additional Funding: Supported by a grant from the TriBeta Research Foundation

ALEX COBIAN-SOTO

Caldwell University, Class of 2024
Major: **Biological Science**

Faculty Advisor: **Dr. Marjorie Squires,** Associate Professor of Chemistry
School of Natural Sciences

Understanding Antibiotic Resistance: Assessing Antifungal Agents on *Candida* Species

Candida auris is a fungus that poses to be a potential global health threat due to the overuse of antifungal like Fluconazole, which can potentially cause genetic mutations within the cell's DNA, enabling it to survive in harsh environments. Utilizing the Kirby-Bauer technique and observing the zone of inhibition, it is possible to determine the area in which an antifungal is effective against strains of microbes. By observing potential changes in *Candida albicans*, a strain with multiple characteristics similar to *Candida auris*, we can evaluate the efficacy of several treatments – namely, lemongrass essential oil, tea tree oil, and fluconazole – which are known to possess antimicrobial properties. This evaluation indicates which treatments provide lasting benefits and reduce the risk of mutation. By subculturing strains of *Candida albicans* which have been exposed to each treatment individually, it is possible to compare and analyze the resistance of the fungus to these treatments. It was observed that some subcultures showed slight resistance to certain treatments. However, the difference observed was insignificant and we were unable to consistently reproduce these findings, suggesting that it is solely the result of naturally occurring random mutations. Our findings imply that lacking reliability and the unpredictability in terms of interactions between microbes and treatments will continue to be a concern in the context of public health.

ALFREDO DI PAOLA

Seton Hall University, Class of 2024
Major: **Biochemistry**

Faculty Advisor: **Dr. Sergiu M. Gorun,** Professor
Department of Chemistry and Biochemistry

Immobilized fluorinated nickel phthalocyanines on solid-state supports

Nickel phthalocyanine, PcNi, exhibits low photoactivity in homogeneous systems. The anchoring of sulfonated PcNi on oxidic supports results in a catalyst that oxidizes 2,4-dichlorophenol. The effects of fluorination on catalytic activity were examined by the immobilization of a perfluorinated nickel phthalocyanine on an amino-functionalized silica support. The ability of this catalyst to oxidize 2,4-dichlorophenol via the photoproduction of reactive oxygen species will be reported.

Additional Funding: Center for Functional Materials and The Seton Hall University Department of Chemistry and Biochemistry

Acknowledgments: Dr. Sergiu Gorun and Dr. Marius Pelmus

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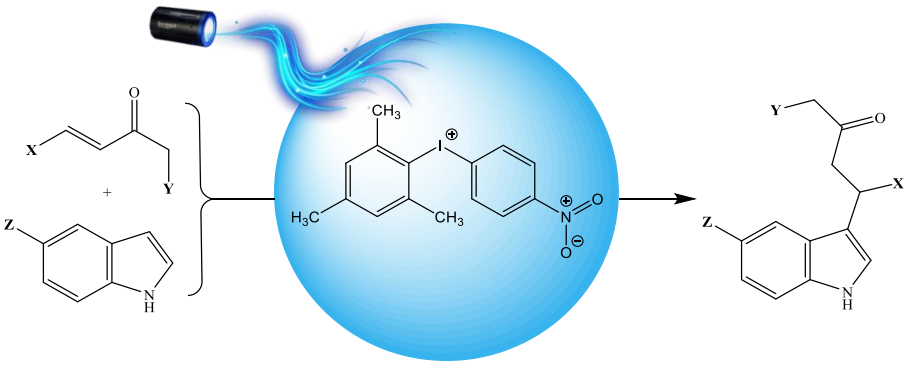
PROJECT 12

SAHIL D'SOUZA

Seton Hall University, Class of 2026
Major: **Biochemistry & Religious Studies**

Faculty Advisor: **Dr. Joseph Badillo,** Assistant Professor
Department of Chemistry and Biochemistry

Photoacid Generator Catalysis for Conjugate Addition Reaction



Visible Light Induced PAG Catalysis

Photoacid generators (PAGs) have been of interest in the scientific community because they are able to be used in green and sustainable chemical processes having various applications, including pharmaceutics for cancer treatment, microfluidics for the microelectronic industry, and for stereolithography material science related to polymers. Recent studies have identified PAGs to function exceptionally well as catalysts for organic synthesis. In this project, we propose that various PAGs, primarily mesityl(4-nitrophenyl)iodonium triflate, can catalyze the Michael addition between various substituted indoles and a range of alkyl vinyl ketones to form the corresponding β-indolyl ketone derivatives. PAGs when used for Michael Addition reactions are useful because they offer high chemo selectivity, a broad scope, and require only mild conditions. This protocol is amendable to a wide range of Michael acceptors such as cyclohexanone, malonate, and coumarin, as well as a variety of electronically diverse indoles and Michael donors to facilitate the desired 1,4-conjugate addition. Mechanistic studies and pH analysis have shown that light is required for reaction initiation. Catalyst photodegradation studies show control of acid generation in the system upon irradiation.

Independent Colleges Undergraduate Research Award Recipient 2024

Additional Funding: We would like to acknowledge the New Jersey Space Grant Consortium (NJSGC) and NASA Summer Research Fellowship for their support, as well as the National Science Foundation (NSF) for the LEAPS Award.

Acknowledgments: I would like to thank my mentor Dr. Joseph Badillo, as well as the Department of Chemistry and Biochemistry at Seton Hall University.

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PROJECT 13

MICHAEL ECKEL SANTOS

Seton Hall University, Class of 2024
Major: **Biology**
Minor: **Chemistry**

Faculty Advisor: **Dr. Sergiu M. Gorun,** Professor Department of Chemistry and Biochemistry

Photocatalytic degradation of malathion

The increasing use of Malathion, an organophosphate pesticide employed for killing mosquitoes and flies, has led to recent reports of its poor removal from wastewater by conventional means. We report that Malathion is photodegraded by a reactive oxygen species (ROS) generated by a robust perfluorinated zinc phthalocyanine ($F_{64}PcZn$) photocatalyst under both homogeneous (examining the influence of polar and nonpolar solvents) and heterogeneous (by infusion) reaction conditions. GC-FID analysis reveals that in homogeneous systems nonpolar aprotic solvents such as dichloromethane gave the highest degradation rate, which is consistent with the longest lifetime of singlet oxygen, which is the main ROS produced by $F_{64}PcZn$. Furthermore, in heterogeneous systems the photocatalyst $F_{64}PcZn$ is anchored on alumina (Al_2O_3), which shows 85% of Malathion being degraded in 8 hours. The combination of catalyst stability and fast Malathion degradation suggests that supported fluorinated photocatalysts are promising Malathion photoactivators.

Acknowledgments: Dr. Gorun, Marius Pelmus, Abigail Hall, Sean Scally, and Seton Hall Biochemistry Department

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PROJECT 14

MARIA JUANITA FRANCO

Centenary University, Class of 2026
Major: **Biology**
Minor: **Environmental Science**

Faculty Advisor: **Dr. YL Cha,** Assistant Professor of Biology
School of Natural, Health, Social and Behavioral Sciences

Comparative Analysis of Anxieties: Impact of Social Isolation vs. Social Interaction in Hamster Model

Understanding the influence of social interaction and isolation on anxiety levels in rodents holds significant implications for elucidating human anxiety disorders and potential therapeutic interventions. In this study, we aimed to investigate the differential effects of social interaction and isolation on anxiety levels in rodents and explore exercise implementation as a potential therapeutic implication for humans.

Using a controlled experimental design, we divided rodents into two groups: Group A, comprising socially housed rodents, and Group B, consisting of rodents subjected to isolation. We assessed anxiety levels through activity monitoring with different tests like; open field and marble burying, this project was reviewed by Institutional Animal Care and Use Committee (IACUC) of Centenary University. Group A exhibiting more activity level, were the rodents wanted to explore the area unlike group B which demonstrated a state of anxiety by trying to hide in corners during the open field test

Our findings indicate a significant difference in anxiety levels between socially housed and isolated rodents, suggesting that social interaction may mitigate anxiety-related behaviors in rodent models. Group A rodents were more calm and friendly with the human touch and test than the rodents in group B, which were more anxious and afraid of the human touch. These observations underscore the potential therapeutic benefits of social interaction in ameliorating anxiety-related symptoms in human diseases.

In conclusion, our study highlights the importance of social interaction in modulating anxiety levels in rodents and suggests avenues for further research into the therapeutic potential of social interventions for anxiety disorders in humans.

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PROJECT 15

SECOND PLACE AWARD

ISABELLA FURRICK

Stevens Institute of Technology, Class of 2024
Major: **Chemical Engineering**
Minor: **Environmental Engineering**

Faculty Advisor: **Dr. Alyssa Hensley,** Assistant Professor
Department of Chemical Engineering and Materials Science

Designing Nickel-Platinum Bimetallic Catalysts for Fuel Cell Applications Using Machine-Learned Interatomic Potentials

Hydrogen fuel cells are a promising alternative energy source to carbon-based fossil fuels; however, the high cost and scarcity of the platinum (Pt) catalysts used to facilitate the hydrogen oxidation reaction (HOR) at the cathode limits their widespread use. Nickel (Ni) is a cheaper alternative to platinum, but its oxophilicity leads to the overbinding of HOR intermediates, slowing reaction rates. The performance of a nickel catalyst for HOR can be improved by doping it with a secondary, noble metal such as platinum (Pt). While experimental research on nickel-based bimetallic catalysts has shown encouraging results, little is known about the structure and composition of Ni-Pt catalysts under HOR conditions, as surface reconstruction may occur, but cannot be probed experimentally. With computational modeling, surface reconstruction can be observed, and reconstruction trends identified allowing for more informed design decisions. In this study, a machine learned Spectral Neighbor Analysis Potential (SNAP) for Ni-Pt catalysts with oxygen (O*) bound to the surface was developed. The potential was trained on ab initio data generated for a diverse set of structures, compositions, and environmental conditions. Potential accuracy was evaluated by setting objective functions for lattice parameters, formation energy, and adsorption energy. At the end of development, the potential was able to predict the formation energy of a Ni-Pt (111) Slab with O* bound to the surface with an error less than 0.4 eV/atom.

Independent Colleges Undergraduate Research Award Recipient 2024

Acknowledgments: Mitchell Wood and the FusMatML Team at Sandia National Lab, Sustainable Horizon's Institute SRP 2023

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PROJECT 16

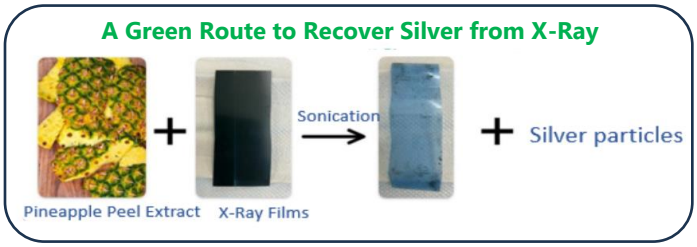
JAYDEN HERON

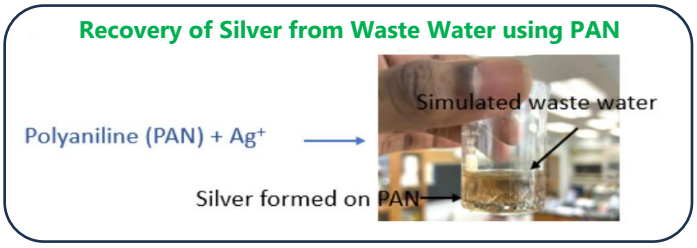
Caldwell University, Class of 2026
Major: **Medical Technology**

Faculty Advisor: **Dr. Xiaolei Gao,** Associate Professor of Chemistry
School of Natural Sciences

Green Recovery of Silver form S-Ray Films and Photographic/S-Ray Fixer Waste

Photographic film printing and radiographic film development generate a considerable amount of silver waste. Driven by concerns over the impact of silver waste on the environment, we set out to develop practical and instrument-free ways for the sustainable recovery of silver from X-ray films and photographic/X-ray fixer waste. Based on the knowledge that the enzyme in fresh pineapple, bromelin, breaks down gelatins, we extracted the enzyme from pineapple peels we gathered from our cafeteria and applied it to X-ray films, resulting in the black silver layer peeling off from the plastic film gradually. Adopting sonication in the process greatly speeds up the process. Further investigation on how the freshness, concentration of pineapple extract, and temperature impact the rate of silver removal from X-ray films is undergoing. We also delved into the use of polyanilines (PAN) for recovery of solver from photographic/X-Ray fixer waste. The reaction between PAN and silver nitrate solution proceeded beautifully, with silver crystals formed on the surface of PAN. We are positioned to use PAN to recover silver from the fixer solution next. By offering low-cost and eco-friendly ways for silver recovery, this research strives to tackle environmental issues while preserving the beauty of silver, for future generations.





Additional Funding: Caldwell University Independent Research Program

Acknowledgments: Chidimma Chima (collaborator); Professor William Velhagen of Caldwell University

DAVID HOYT

Drew University, Class of 2024
Major: **Biochemistry and Molecular Biology**
Minor: **Public Health and Anthropology**

Faculty Advisor: **Dr. Brianne Barker,** Biology Department Chair
Biology Department

Investigating the Innate Immune Response to Double Stranded and Single Stranded DNA Viruses

The innate immune response to double stranded DNA viruses and RNA viruses have been heavily studied in the last decade, identifying major intracellular sensors and transcription factors that recognize these viruses that cause severe disease, like HPV and Covid-19. The innate immune response to single stranded DNA viruses is not as well studied, potentially a consequence of these viruses not causing serious disease in humans. An immune response is usually associated with symptoms and disease, meaning that the lack of severe disease could be a result in a different innate immune response or potentially even no response at all. To investigate this question, cells were treated with single stranded and double stranded DNA transfection, and following RNA extraction and cDNA synthesis a qPCR for Interferon Beta was performed to measure the innate immune response. There was found to be Interferon Beta production upon transfection of double or single stranded DNA, meaning that there is an innate immune system response to both types of genomes. This would suggest that single stranded DNA viruses are sensed by the innate immune system. The findings of this experiment have spurred follow-up experiments using aphidicolin to investigate if sensing occurs when the DNA is single stranded or following the production of the double stranded DNA intermediate similar by a mechanism similar to the innate immune response to double stranded DNA viruses. Moving forward, elucidating the specific nucleic acid state recognized by the innate immune system will help plan experiments to identify the proteins involved in the response to single stranded DNA viruses, ultimately providing clues to help understand the differences between single stranded and double stranded DNA viral infections and the details that impact the innate immune response and the potential for serious disease progression.

Independent Colleges Scholarship Award: ***Schering-Plough Undergraduate Research Scholarship 2023-24***

Additional Funding: Novo Nordisk

Acknowledgments: Dr. Brianne Barker, Dr. Stephen Dunaway, Drew University, and Novo Nordisk

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PROJECT 18

HADIA TUL IMAN
Saint Peter's University, Class of 2025
Major: **Biology**
Minor: **Chemistry and Psychology**

Faculty Advisor: **Dr. Laura H. Twersky,** Professor
Department of Biology

RATIBA MEGALLA
Saint Peter's University, Class of 2025
Major: **Biology**
Minor: **Chemistry**

Effects of Microplastics/Endocrine Disrupters on Skeletal Development

Considering microplastics and endocrine disruptor's profound impact on ecosystems and human health, this study explores microplastics' and endocrine disruptors' toxicity, focusing on their impact on skeletal development. We are investigating the relationship between microplastic contamination and skeletal development using the model organism *Xenopus laevis* (African clawed frog). The advantages of using *Xenopus laevis* include transparency during the tadpole stage, which aids us in determining microplastic effects on skeletal development. *Xenopus* eggs will be obtained by injecting 500 IU of chorionic gonadotropin into the dorsal lymph sac of both male and female frogs. Specimens at Nieuwkoop and Faber stage 9 (late blastula) will be exposed to 5ug/ml and 10 ug/ml of polystyrene and polyethylene (common microplastic components) individually and in combination. Skeletal development will be assessed using the Alizarin red (3%) and Alcian blue (1%) staining technique. Neurula stages 13-22, tailbud stages 23-28, late tailbud stages 29-36, and tadpole stages 37-45 will be specifically studied. The staining procedure includes fixation in paraformaldehyde, rinsing in PBS, staining cartilage with alcian blue solution, dehydration in ethanol, clearing, staining mineralized bone with alizarin red solution, and mounting on slides using DPX or a suitable medium. Stained specimens will be photographed, and the distribution of cartilage and bone will be assessed. There is minimal research on microplastics' impact on skeletal development. Studies highlight how exposure to microplastics can disrupt bone development in various ways, including skeletal growth arrest, causing skeletal deformities, impairing bone quality, and promoting mutagenic consequences, ultimately compromising bone formation and integrity in amphibians and fish. Long-term exposure to polyethylene and polystyrene microplastics in aquatic organisms such as zebrafish has been linked to impaired skeletal growth and an increase in deformities. Microplastics made of polystyrene may accelerate the aging of bone-forming cells, potentially affecting skeletal growth and increasing human susceptibility to bone deformities, such as osteopenia and osteoporosis after being tested on zebrafish development (Tarasco et al., 2022). We will present a literature review on the effects of microplastic components/endocrine disruptors on skeletal development. Various endocrine disruptors, including flame retardants, pesticides, phthalates, bisphenol A (BPA), and toxic metals like cadmium and lead, can negatively affect bone development by interfering with hormonal pathways essential for bone formation and maintenance, ultimately leading to reduced bone mineral density, impaired osteoblast function, and increased risk of skeletal deformities and osteoporosis.

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PROJECT 19

ADITYA KASINA
Seton Hall University, Class of 2026
Major: **Biology**
Minor: **Philosophy**

MARCO FANIK
Seton Hall University, Class of 2026
Major: **Biology**

Faculty Advisor: **Dr. Jessica Cottrell, Associate Professor of Biological Sciences; Chair**
Department of Biological Sciences

Effect of Orthosilicic Acid and Cholecalciferol on MC3T3 Osteoblast Cells under High TNF-a Treatment Simulating Inflammatory Diabetic Conditions

Diabetes mellitus adversely affects bone fracture healing by inhibiting osteoblast proliferation and differentiation through elevated levels of tumor necrosis factor alpha (TNF-a). Experimental approaches involving compounds like Vitamin D and Silicon Chelates have shown promise in enhancing bone healing in healthy animals. To delve deeper into osteoblast proliferation, our research aims to test these compounds on MC3T3 osteoblast cells in vitro. Orthosilicic acid, a form of silicon, and Cholecalciferol, Vitamin D3, have individually shown potential in bone health. Our hypothesis suggests that combining Orthosilicic Acid and Cholecalciferol will enhance MC3T3 cells exposed to TNF-α, resembling conditions in diabetic mice. We evaluated this hypothesis thus far by measuring these effects on cell proliferation and viability via MTT proliferation while varying the different combinations. Our preliminary findings indicate a significant reduction in cell proliferation post TNF-a treatment. Combined treatment with cholecalciferol (100nM) and/or vitamin D3 (20uM) did not significantly rescue the cells from the effects of TNF-a after 72 hours. The negative effects of TNF-a is consistent with current literature. However, the effects of cholecalciferol and orthosilicic acid need to be further investigated. We hope that further testing elucidates positive osteoblast activity from these compounds and then proceed with bone fracture healing in mouse models.

Independent Colleges Scholarship Award: ***Novo Nordisk, 2023-24*** *(Fanik)*

Acknowledgments: Dr. Jessica Cottrell, Cottrell Research Lab

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PROJECT 20

JAY KHANDELWAL

Drew University, Class of 2024
Major: **Biochemistry and Molecular Biology**
Minor: **Business**

Faculty Advisor: **Dr. John Perkins,** RISE Fellow
Research Institute of Students Emeriti (RISE)

Isolation of decoyinine-resistant mutants of *Bacillus subtilis* that increases the production of guanosine triphosphate (GTP), a precursor of riboflavin (vitamin B2) biosynthesis.

B. subtilis is a Gram-positive bacterium that produces a wide range of natural products. One class of products are vitamins, such as riboflavin (vitamin B2). Riboflavin is a natural vitamin that is converted to FAD and FMN, key coenzymes involved in energy metabolism, cell respiration and many cellular enzymatic reactions. At Drew University's Research Institute for Scientists Emeriti (RISE), we have been working to improve the production guanosine triphosphate (GTP), a key precursor to riboflavin, using classical strain improvement. Previously, we used a random mutant library of *B. subtilis* cells prepared using EMS (ethyl methyl sulfonate) to isolate azaguanine (Az^r) resistance mutants. This resulted in a strain, Az8, which generated elevated levels of guanine, as determined by HPLC; increased guanine levels are an indicator of increased GTP levels. To further increase GTP levels, we report here on the introduction of a second mutation into Az8 that confers resistance to the adenosine analog, decoyinine (Dc) using classical mutagenesis and screening. Like azaguanine, decoyinine acts as a competitive inhibitor of biosynthetic enzymes that convert guanine to GTP. To isolate such Dc-resistant mutants, we prepared an EMS random mutant library of Az8 and screened for decoyinine resistant colonies; Az8 contains a preexisting purB mutation that enhances the recovery of Dc-resistant mutations in the GMP-IMP-AMP junction of the purine pathway. Eleven decoyinine-resistant mutants (Dc^r) were recovered and analyzed for guanine levels using High-Performance Liquid Chromatography (HPLC). Of these 11 mutants, two mutants, Dc-3 and Dc-9, had elevated levels of guanine and polar compounds that we believe represent phosphorylated purines. The Az- and Dc-resistance mutations in these double mutants, were subsequently transferred in toto to a *purA*-containing *B. subtilis* strain by DNA transformation in preparation of converting the elevated GTP levels to riboflavin by introduction of a roseoflavin-resistance mutation that deregulates expression of the riboflavin biosynthetic genes.

Acknowledgments: Dr. John Perkins, RISE faculty & students, and Drew University

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PROJECT 21

OLIVIA KONDROSKI-MARION

Centenary University, Class of 2024
Major: **Equine Pre-Vet**

Faculty Advisor: **Dr. Taylor Lynn,** Professor of Equine Science
Department of Equine Studies

Blood Clotting Time Differential Based on Phenotype

In the animal community, which includes the veterinary profession, it is a well-known theory that animals presenting with a predominantly white phenotype seem to bleed longer. Several studies exist to support the theory that phenotype affects the expression of medically important characteristics in humans. No research has been brought forward to prove or deny this theory in animals. As such, this research study sought to prove if blood clotting time is linked to phenotypic status. There are countless studies that use clotting times to study other factors in animals. These studies serve as a template for how to conduct this research, but no other studies include each animal's phenotype as a delineating factor. As such, the research must be performed again with phenotype in mind. In the first preliminary blood draw for this study, two sibling intact male rabbits, a white and a coloured, had their blood drawn and a significant difference in clotting times was observed. To continue this study, a second day of blood draws were performed. A total of 8 rabbits: 4 coloured and 4 white, had their blood drawn and clotting times manually determined. The expected clotting time was 180 – 220 seconds based on a study by Pichotka & Reichel. The clotting times were then compared using a 2 tail T-test both within the colour groups and between the two test groups.

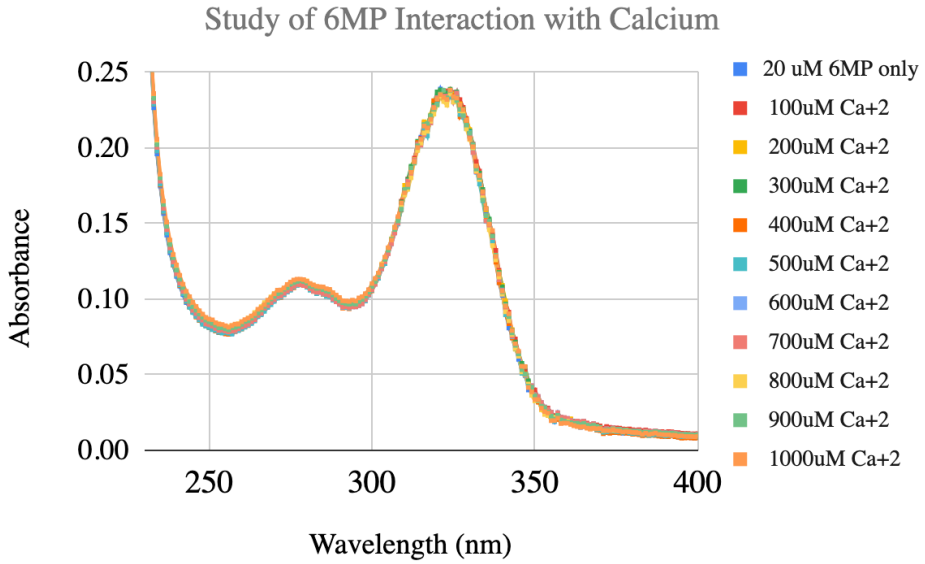
BRAD MAHONEY

Saint Elizabeth University, Class of 2024
Major: **Biochemistry and Business Administration**

Faculty Advisor: **Dr. Bidisha Banerjee,** Assistant Professor of Chemistry and Biochemistry
Chemistry Department

Analyzation of the Interaction of an FDA Approved Anti-Cancer Drug 6 Mercaptopurine (6-MP) with Calcium (Ca^{+2}) A study Using UV Spectroscopy

This research project investigated the interaction between the FDA-approved cancer drug, 6-mercaptopurine (6-MP), and calcium using UV Spectroscopy. The methodology used for this study was to make a stock solution of the 6-MP pure drug (obtained from thermo fisher) in DMSO and then the drug was diluted to 20 µM. The typical physiological ionic calcium concentration ranges from 47-52 µg/mL Using the previously used methodology of Cu^{+2} and 6 MP studies, the drug was titrated with Ca^{+2} concentrations in the range of 10-100 µg/mL. The Ca^{+2} solution was diluted from a stock solution of 1M. Absorbance values were recorded in the range of 200- 400 nm and values are shown in Figure 1. After these preliminary studies, not a major change in absorbance maxima for 6- MP was observed when calcium was titrated. This could be interpreted as Ca^{+2} does not interact with the 6-MP or the study method was not fit to detect the interactions. Further investigations need to be undertaken to find a more robust way to quantify and verify the above two plausible explanations.



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PROJECT 23

CHRISTOPHER MIRANDA
Georgian Court University, Class of 2025
Major: **Exercise Science**

JOSEPH SAUCHELLI
Georgian Court University, Class of 2024
Major: **Exercise Science**

Faculty Advisor: **Dr. Vincent Chen,** Associate Professor of Exercise Science, Hackensack Meridian Health School of Nursing & Wellness
Department of Exercise Science, Wellness & Sport

Effects of Resistance Exercise Training on Muscular Fitness and the Correlation Between Endurance Capacity and Agility in Division-II Collegiate Soccer Players

Purpose The sport of Soccer requires aerobic endurance, anaerobic strength, and agility. Resistance exercise training (RET) has been shown to improve muscular strength. While maximal oxygen consumption rate (VO2max) reflects endurance capacity, it does not predict performance, and therefore, agility has not been examined to identify its relationship with VO2max. In addition to examining the effects of RET on muscular mass, strength, power, agility, and endurance capacity, the purpose of this study was to investigate the relationship between endurance capacity and agility before and after RET in soccer players.

Methods: Twenty Division-2 collegiate male soccer athletes (age: 18-22 yrs) were recruited to perform a 10-wk whole-body, progressive RET program. Muscle mass, strength (1RM), power (Wingate, triple-broad jump), agility T-tests, and endurance capacity (beep test, VO2max) were measured before and after RET.

Results: After 10 weeks of RET, muscle mass (84.46 ± 3.34 to 86.24 ± 3.29 LB, $P=0.026$), composite strength (bench press + squat; 469.44 ± 24.79 to 499.44 ± 25.78 LB, $P<0.001$), Wingate power test (831.20 ± 34.23 to 917.80 ± 34.98 W, $P=0.003$), and triple-broad jump (7.42 ± 0.18 to 7.87 ± 0.19 M, $P=0.004$) all improved. While VO2max, beep test, and Agility T-test remained unchanged, VO2max was correlated with the better Agility T-test results ($R=0.676$, $P=0.001$) before, but not after ten weeks of RET.

Conclusion: This study showed that RET improved muscle mass, strength, and power in young soccer athletes. While endurance capacity and agility remained unchanged, they were correlated before the training, and the relationship dissipated after the training. The result indicated that RET might diminish the influence of endurance fitness on agility performance.

Acknowledgment: John Esposito

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PROJECT 24

BARBARA MUNOZ
Saint Peter's University, Class of 2025
Major: **Biology**
Minor: **Chemistry**

Faculty Advisor: **Dr. Laura H. Twersky,** Professor
Department of Biology

CARLOS DUQUE SANCHEZ
Saint Peter's University, Class of 2025
Major: **Biology**
Minor: **Chemistry**

Effects of selected microplastics and endocrine-disrupting chemicals, on the cardiovascular system of *Xenopus laevis* (clawed frog)

Microplastics (MPs) and nanoplastics are concerning pollutants, which are widely dispersed in the environment. They have toxic effects such as cancer and birth defects. Various species, including those of amphibians and mammals, have detectable microplastics in their cardiovascular systems. These particles have been linked to angiogenesis dysfunction and myocardial damage. We are investigating the impact of MPs on the cardiovascular functions of the model organism *Xenopus laevis*, (clawed frog). Advantages of utilizing *Xenopus laevis* include a transparent body during the larval phase, rapid development, and the convenience of acquiring and maintaining large numbers of embryos and larvae in the laboratory. Nieuwkoop and Faber stage 30 (xenbase.org) specimens were incubated at concentrations of 0.01% polystyrene, polypropylene, polyethylene terephthalate, (common microplastic components), For these groups, 0.01% solutions were made from aged tap water that the microbeads were boiled in. Other groups of specimens were exposed to 5ug/mL bisphenol A, and in 5ug/mL bisphenol S (endocrine disruptor plasticizers). Developmental rate, motility, mortality, and heart rate are measured. Preliminary results indicate that in the polystyrene, polypropylene, polyethylene terephthalate, bisphenol A, bisphenol S groups, there were lower heart rates, slower motility, and delayed developmental stages compared to control groups. The developmental abnormalities observed in the organisms include irregular heart rhythm, enlarged heart, hemorrhaging, and displacement of the eyes. These abnormalities were identified through analysis of video footage. Future research will investigate cardiac tissue to determine if microplastics are present, along with analyzing blood morphology.

Additional Funding: Supported by a grant from the TriBeta Research Foundation

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PROJECT 25

HARRIS NAQVI

Drew University, Class of 2024
Major: **Neuroscience**

Faculty Advisor: **Dr. Christina McKittrick,** Program Director, Associate Professor of Biology
Department of Neuroscience

The Effects of Environmental Stress on a Mouse Model of ADHD

Attention-deficit/hyperactivity disorder (ADHD) is generally characterized by inattention, hyperactivity, and impulsivity; other symptoms of ADHD include distractibility, deficits in learning and memory, and other cognitive impairments. It is one of the most common neurodevelopmental disorders in children and adolescents in the United States, and is correlated with other comorbid disorders in adulthood, such as substance use disorder (SUD).

Since evidence suggests that early life experiences may have an impact on the development of both ADHD and SUD, we used excessive sensory stimulation (ESS) in juvenile mice as a potential model of ADHD, which consisted of loud music accompanied with flashing lights for 4-6 hours a day for 16 days in Experiment 1 and 6 hours a day for 52 days in Experiment 2. Ravinder et al. (2016) showed that exposure to ESS led to hyperactivity, increased cocaine vulnerability, and increased cocaine sensitization in male mice. However, to date, no studies have examined the effects of ESS on learning and memory, nor have they looked at the effects of ESS in females. Environmental differences were created by varying the amount of bedding, enrichment objects, and cage mates in their home cages. In Experiment 1, animals were placed in three different housing conditions (enriched, standard, and isolated) and ESS conditions (ESS and no ESS). In Experiment 2, animals were placed in four different housing conditions: enriched, standard, isolated, and isolated with ESS.

We used the Morris Water Maze (MWM) to examine the effects of housing environments on spatial learning and memory. In Experiment 1, we found a significant effect of ESS on latency to platform during the training days, with ESS groups having a decreased latency after day 1, indicating a faster rate of learning. These effects, however, were not observed in Experiment 2. The Open Field Test (OFT) was used to measure anxiety-like behaviors and cocaine locomotor sensitization in response to a 2-injection paradigm (as outlined by Valjent et al., 2010). In Experiment 1, the standard group had greater baseline distance traveled, indicating less anxiety-like behavior. In Experiment 2, however, the isolated ESS group had greater distance traveled. In both experiments, distance traveled in response to the second injection was greater than the first, signifying that all groups became sensitized to cocaine. In Experiment 1, the individual groups had greater distance traveled after injections, however, no differences were detected in the change in distance between injection 1 and 2. There were no main effects of environment observed in Experiment 2. These results suggest that early life exposure to ESS affects learning and memory and cocaine sensitization variably, and that the ESS as a model of ADHD may not be a valid and consistent rodent model for the disorder.

Independent Colleges Scholarship Award: ***Novartis Science Scholarship, 2023-24***

Additional Funding: *Beta Beta Beta* Biological Honor Society, Drew University

Acknowledgments: Matthew Coleman, Jacquelyn Dal Bon, Maryann Dillon, Megan Slater

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FIRST PLACE AWARD

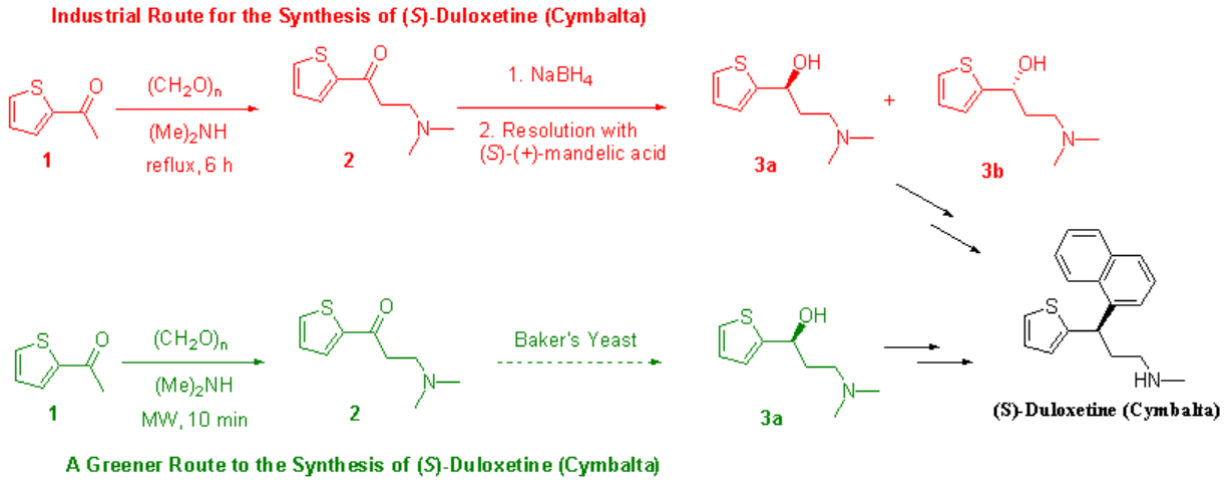
ALYSSA NEGRON
Caldwell University, Class of 2024
Major: **Biology**
Minor: **Chemistry**

MARION HAROUN
Caldwell University, Class of 2025
Major: **Biology**
Minor: **Psychology**

Faculty Advisor: **Dr. Xiaolei Gao,** Associate Professor of Chemistry
School of Natural Sciences

A Greener Route to the Synthesis of Antidepressant (S)-Duloxetine (Cymbalta)

Major depressive disorder (MDD) is a significant global health burden, affecting over 300 million individuals and exhibiting a high association with suicide rates. Pharmacotherapy, particularly the use of antidepressants, is a crucial treatment strategy for MDD. (*S*)-Duloxetine (Cymbalta) is a widely prescribed antidepressant that elevates neurotransmitter levels to alleviate symptoms of depression. The industrial route for synthesizing (*S*)-duloxetine, as illustrated in Scheme 1, involves a Mannich reaction (from compound **1** to **2**) that requires harsh reaction conditions and lengthy reaction times, and also a kinetic resolution (from compound **2** to **3a**) with low yield, lengthy steps, and the usage of multiple chemicals. We aim to develop a safer, faster, and more environmentally friendly synthesis route for (*S*)-Duloxetine using a microwave-assisted reaction and chemoenzymatic reduction. We first investigated the Mannich reaction of 2-acetylthiophene **1**, paraformaldehyde, and dimethylamine using microwave technology. We experimented with different solvents and reaction temperatures and determined methanol at 180 Celsius degrees yielded the best results so far and led to about 50% conversion in 10 min under microwave conditions. Further optimization of reaction conditions to improve the yield is underway. We also carried out model reactions using Baker's yeast to enantioselectively reduce ketone to its corresponding alcohol. We anticipate testing the product from microwave reaction for chemoenzymatic reduction soon.



Research Funding: Caldwell University Independent Research Program

Acknowledgments: Professor Marjorie Squires, and Professor William Velhagen of Caldwell University

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PROJECT 27

PAMELA NOLASCO

Caldwell University, Class of 2024
Major: **Biology**
Minor: **Chemistry**

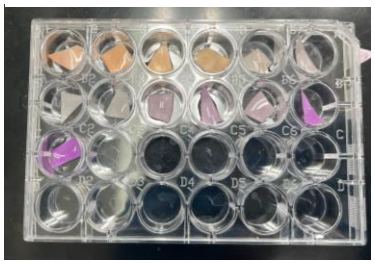
Faculty Advisor: **Dr. Xiaolei Gao,** Associate Professor of Chemistry
School of Natural Sciences

Cochineal Red as a pH-Responsive Food Freshness Indicator, a New Destiny for the Bugs to Dye for

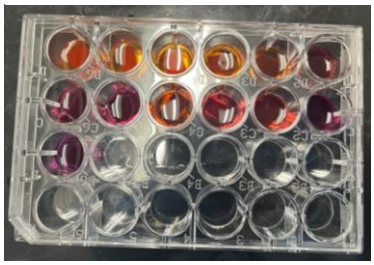
Consumers often rely on the "Use by" date to determine the freshness of food, which is not a reliable indicator. We proposed to develop a pH-responsive indicator as an on-package label to monitor meat freshness since the microbial growth and the enzymatic decomposition of meat release volatile alkaline compounds that change the pH of food.

Cochineal, a red dye from bugs, gives red velvet cake, strawberry ice cream, fruit juices, and red Skittles their vibrant color. Cochineal is pH sensitive and displays a broad range of colors at different pH values. We aim to identify a biodegradable polymer as the host matrix of cochineal red, and apply it to develop a pH-responsive label for real-time monitoring of food freshness. We first extracted the cochineal red from cochineal bugs, followed by embedding the red dye onto filter papers and films synthesized from polyvinyl alcohol (PVA) and agar. We then established the reference colors of the host matrix using pH buffers (1-13) with a special focus on pH 5-6 where meat spoils. We discovered that PVA based films produced pronounced color changes in the pH range of interest. Preparation of a hydrogel-based host matrix and using all three cochineal-embedded polymers to monitor the meat's freshness is in progress. We are also following up on an unexpected color change of the cochineal-embedded PVA films from red to black upon contact with tap water and fountain water (while the red color remains in distilled water), which suggests their potential as a water quality testing tool.

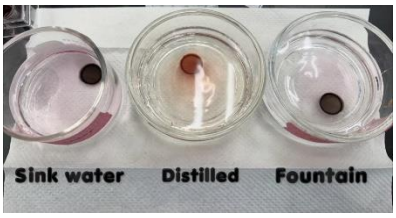
Filter paper trial at pH 1-13



PVA film trial at pH 1-13



Color change of PVA films in tap/fountain water



Additional Funding: Caldwell University Independent Research Program

Acknowledgments: Professor William Velhagen of Caldwell University; **Gabriela Moran** (collaborator)

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PROJECT 28

JULIANNA ORLANDO

Georgian Court University, Class of 2026
Major: **Biology/ Pre-Med**

Faculty Advisor: **Dr. Jessica A. Lisa,** Assistant Professor of Biology
Biology Department

Establishment and response of the gut microbiome of *Caenorhabditis elegans* to pharmaceuticals and personal care products.

Pharmaceutical and personal care products (PPCPs) often contain microplastics, plastics less than 5 millimeters in length, which have been labeled a global threat to ecological environments and to human health. Little is known about the effects microplastics have on the environment and the human body, especially the gut microbiome which consists of bacteria, archaea, viruses, and eukaryotic microbes that aid in important processes such as digestion. The goal of this research was to determine how microplastics affect the composition of the gut microbiome using the model organism *Caenorhabditis elegans*. *C. elegans* N2 eggs were obtained from bleached adult *C. elegans*, grown on NGM plates, and fed a microbial cocktail obtained from soil extract. Half of the nematodes were then exposed to microplastics and allowed to complete one life cycle. DNA extraction of the gut microbiome was then carried out and 16 S rRNA gene sequencing was carried out using Illuminia MiSeq high-throughput sequencing platform. Sequences were processed using the DADA2 bioinformatics pipeline and analyzed using R Project for Statistical Computing. Data show that the two treatments had different relative abundances and ASVs including a higher abundance of *Pseudomonas* spp., *Algoriphagus* spp., and *Nubsella* spp. in the control. Microplastic treatments had high relative abundances of *Flavobacterium* spp., *Sphingobium* spp., and *Novosphingobium* spp. Statistical analyses will be conducted on these data to determine if these specific ASVs driving changes in overall gut microbial community structure as a result of microplastic exposure.

Independent Colleges Undergraduate Research Award Recipient 2024

Acknowledgments: We would like to acknowledge Dr. Bongkeun Song, Gayle Scott, and members of the Song Lab at the Virginia Institute of Marine Science for their contributions to this project.

CAMELLIA OUHADJ

Caldwell University, Class of 2025
Major: **Biology**

Faculty Advisor: **Dr. Marjorie Squires,** Associate Professor of Chemistry
School of Natural Sciences

Investigating Antimicrobial Surgical Attire Fabrics to Mitigate Staphylococcus aureus Proliferation

This research project addresses the critical issue of mitigating Staphylococcus aureus proliferation through the exploration of antimicrobial properties in surgical attire fabrics. Traditional fabrics commonly used in scrubs fabrication, including cotton, rayon, polyester, and spandex, are compared with four novel alternatives: bamboo fabric, zinc-treated fabric, copper-infused fabric, and silver-infused fabric. The objective is to evaluate their effectiveness in reducing bacterial contamination. The research methodology encompassed conducting twelve trials, each involving the use of eight plates, one for each type of fabric, along with an additional plate serving as the control. Throughout these trials, various parameters were systematically altered to assess their impact on bacterial contamination. These variables included the shape and size of the fabric pieces, the method used to inoculate Staphylococcus strain employed. By systematically varying these ensure the accuracy and relevance of the experiment and results, thereby providing a comprehensive understanding of the antimicrobial properties of the fabrics under investigation. Data collection included the use of multiple analytical tools. Raman spectrometry was employed to measure the absorbance of each contaminated fabric, while infrared (IR) analysis was utilized to assess fabric absorbance against a non-contaminated background. The results demonstrate a significant discrepancy between the antimicrobial efficacy of traditional and novel fabric options. Initial findings indicate that silver-infused fabric exhibits the lowest percentage of contamination, suggesting it as the most effective option for mitigating Staphylococcus aureus proliferation. Conversely, polyester fabric exhibits the highest contamination rate, highlighting its inferior antimicrobial properties.

Further analysis, including the translation of results into graphical representations and tables, is ongoing to provide a comprehensive understanding of fabric performance and antimicrobial effectiveness. This research contributes valuable insights into the development of antimicrobial surgical attire, potentially enhancing infection control measures in healthcare settings.

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PROJECT 30

EVAN PAPAGEORGE

Stevens Institute of Technology, Class of 2026
Major: **BE/BA Civil Engineering/Music & Technology**
Minor: **History; Pre-law & public policy**

Faculty Advisor: **Dr. Emma Golden,** Adjunct Professor of Writing & Communications Center School of Humanities, Arts, and Social Sciences

Cultural Epochs and Societal Shifts: Insights from Literature, Music, and Art

Studying cultural history is an essential discipline that offers valuable insights into other disciplines of history. More importantly, it helps us understand our past and shapes our present. Therefore, we must recognize the significance of cultural history and its contribution to our collective knowledge, where cultural history is the collection of human creativity and societal tendencies. Since the advent of the Renaissance around 1300 C.E., culture remains a forerunner in the development of society. As historians analyze the development of culture since the rebirth of society, the question arises: is there a system in which cultural history can act as an analyzing tool outside of itself?

The structure of this presentation requires a division of such a vast period of human history into more manageable segments. When delving into initial research, different disciplines of culture had pre-existing definitive times: literary periods, musical periods, and artistic periods. While there are some differences, a majority of each of the three's main trends overlap, leaving the following periods - with roughly approximate dates in C.E.: The Renaissance from 1300-1600, The Baroque era from 1600-1750, The Enlightenment from 1750-1815, The Romantic period from 1815-1900, and The Modern era into the post-modern era from 1900-today. Extrapolating these periods into a matrix of music, literature, and visual art allows for a thorough analysis of their impacts.

Since these eras exist in many disciplines, works of visual art, literature, and music can be defined to analyze cultural theory as a capsule in time that modifies the current state of society at their creation. By examining works of these disciplines, this research shows that the analysis of visual art, music, and literature can act as a time capsule that represents the state of the geo-political and scientific history at the time of their creation through trends in their individual analyses.

Acknowledgments: Thanks to Emma Golden, Courtney Walsh, and HASS

OLIVIA PARLOW

Stevens Institute of Technology, Class of 2024
Major: **Science, Technology, and Society**
Minor: **Medical Humanities and Accounting**

Faculty Advisor: **Dr. Nick Byrd,** Assistant Professor
School of Humanities, Arts, and Social Sciences

Medical Decision-making

Treatment of bacterial infections with antibiotics drastically transformed the medical system and saved countless lives. However, due to antibiotic overuse and misuse, the medical system is confronted with a potentially existential crisis: antibiotic resistance. To prevent this, experts are studying new therapeutics to treat bacterial infections. However, less attention has been dedicated to patients' role in the overprescription of antibiotics. To fill this gap in the literature, we conducted a randomized controlled trial to investigate the effect of an educational exam room poster and an automated text message reminder (compared to active controls) on ordinary people's decisions about antibiotics, over-the-counter alternatives, and trustworthiness of a doctor (N = 209). Controlling for nearly a dozen confounds, both the poster and text message reminder caused large reductions in the probability that people would ask for probably unnecessary antibiotics ($\beta < -0.6$, $p < 0.003$) and large increases in the odds of seeking over-the-counter medications before trying antibiotics ($OR > 3.3$, $p < 0.009$). Also, participants who received the text message reminding them that their symptoms probably do not merit antibiotics were far less likely to trust a doctor who offered to write them a prescription for antibiotics ($\beta = -0.55$, $p = 0.004$). These data suggest that (1) passively educating patients may be among the lowest-cost, easiest-to-implement, and most effective interventions to reduce the risk of antibiotic resistance and (2) doctors who are perceived as overprescribing antibiotics may be deemed significantly less trustworthy.

Funding: Stevens Institute of Technology

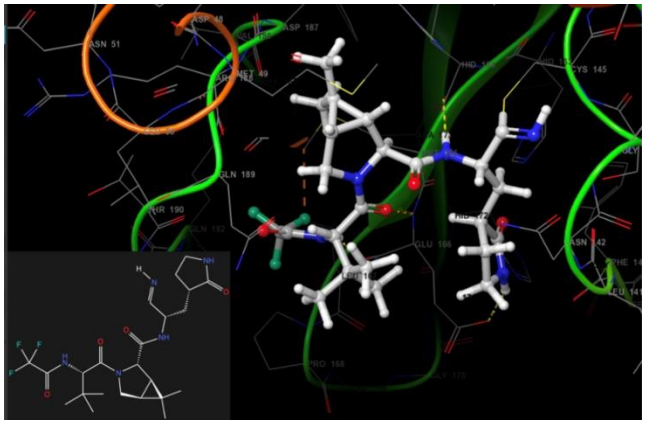
ALEXIS POPE

Stevens Institute of Technology, Class of 2024
Major: **Biology**
Minor: **Healthcare Leadership and Management**

Faculty Advisor: **Dr. Sunil Paliwal,** Teaching Associate Professor
Department of Chemistry and Chemical Biology

Machine Learning and AI-Driven Design and Synthesis of Metabolically Stable Analogs of Pfizer COVID 19 Compound (Nirmatrelvir)

When COVID-19 hit the world, there was a search for a treatment for the virus in infected patients. Pfizer patented Nirmatrelvir in 2021, a protease inhibitor that stops viral replication in the body and can be taken as an oral treatment for COVID-19. Due to Nirmatrelvir being metabolized in the body too quickly, it is paired with Ritonavir, which slows the molecule's metabolism. The problem with this is that other drugs taken by the patient will also have a slowed metabolism which can alter their effectiveness. To find an analog to Nirmatrelvir that could inhibit the replication of COVID-19 and be metabolically stable as to be compatible with other essential medications, computer programs were used to screen designed molecules to predict their ability to dock to the protease. To have a metabolically stable COVID-19 inhibitor would mean that patients who contract COVID and may be at risk of the virus giving them health issues can take this drug orally without halting their other essential medications. During this research, a molecule was designed with blocked metabolic sites while keeping key interactions, selected based on its docking score, and the synthesis was performed in the lab.



Nirmatrelvir binding to COVID protease in Schrodinger Maestro

Independent Colleges Undergraduate Research Award Recipient 2024

Acknowledgments: Sunil Paliwal, Mihika Shah, Maria Fadelici, and Krista Scartozzi

Independent Colleges and Universities of New Jersey
2024 Undergraduate Research Symposium
strengthening communication, critical thinking and technical skills
PROJECT 33

DANILO ROCENOVIC
Saint Peter's University, '25
Major: **Biology**

SHEREEN HANNAH
Saint Peter's University, '25
Major: **Biology**

KATHERINE SANCHEZ
Saint Peter's University, '25
Major: **Biology**

Faculty Advisor: **Dr. Laura H. Twersky,** Professor
Department of Biology

Effects of Microplastic Components, Individually and in Combination, on Neurodevelopment in *Xenopus laevis* (clawed frog)

Microplastics (MPs), globally concerning pollutants (ranging in size ≤5 mm), pose a threat to ecosystems' and organisms' health. More research is needed on these pervasive environmental pollutants and their toxic effects, such as birth defects and cancer formation. Studies have shown the harmful effects of MPs in fish, avians, and mammals. Mattson et al. (2017) showed that MPs with a size of 0.18 µm can cross the blood-brain barrier and accumulate in the brain tissue of *C. carassius* (Crucian carp). Exposure to polystyrene (PS) microplastics in studies with *O. niloticus* (Nile tilapia) showed that prolonged polystyrene exposure led to decrease in acetylcholinesterase (Ding et al., 2018). Prolonged BPS exposure in zebrafish led to a decrease in tracking capability of males, suggesting structural damage to the retina: abnormalities in retinal layers, reduced retinal length, and alterations in the arrangement of photoreceptor cells (Liu et al., 2017). Exposure of *Xenopus laevis* embryos to BPA during the neurula stage leads to morphological aberrations, disrupted Notch signaling, and specific impacts on neural differentiation (Baba et al., 2009). We are conducting experiments on the effects of common components of MPs on ocular development and neurodevelopment in *Xenopus laevis* (clawed frog). Advantages of using this model organism include its transparent larval stage, rapid rate of development, complex behaviors, accessibility and ease of maintenance in the lab. Specimens were exposed at early gastrula (Nieuwkoop and Faber (NF) stage 10) and early neurula (NF 12) stages and were incubated under the following conditions: (A) 0.01% polystyrene (PS), (B) 0.01% polyethylene (PE), (C) 0.01% polypropylene (PP), and (D) 0.01% combination of each: PS + PE +PP. Microplastic beads (25g) were boiled for 30 minutes to allow the extraction of plastic compounds, and A to D solutions listed above were 0.01% microplastic-derived solutions. Neural development, ocular development and motility were observed with a qualitative motility assay and video observations. Preliminary results suggest a correlation between microplastic exposure and abnormal neurulation. Lower motility values and different behavior patterns of movements of tadpoles were observed in polyethylene, polystyrene, and polypropylene groups, but not in the combination group. Additionally, ocular malformations were observed: microphthalmia (PE), cataracts (PS) and eye displacements (in all groups but the greatest number in PS). In future research, specimens will be exposed to solutions of BPA, water from plastic water bottles, and direct incubation with PS microbeads.

Independent Colleges Undergraduate Research Award Recipient 2024

Independent Colleges Scholarship Award: ***Novartis Science Scholarship 2023-24***

Additional Funding: Tri-Beta Research Foundation

CIARA RODRIGUEZ

Centenary University, Class of 2024
Major: **Psychology**

Faculty Advisor: **Dr. Christine Floether,** Associate Professor
Psychology Department

The Implications of the Stigma Surrounding Schizophrenia

Individuals with schizophrenia are perceived negatively by the general public, and this phenomenon has a harmful impact on those with the disorder. Currently, psychologists have suggested changing the name of the disorder to reduce this stigma. However, the researcher questioned whether the title or the actual symptoms yielded the stigma. To determine the primary cause, the researcher developed nearly identical scenarios and manipulated the symptoms of schizophrenia being displayed and whether or not the title of the disorder was stated. To analyze the results, the researcher scored each response as an overall positive or negative outlook on the individual based on yes/no responses to numerous questions. Then, chi squares were conducted to determine if there was a significant difference in the overall view of the individual depending on the symptoms displayed and label given. Ultimately, both the label and the symptoms created significant stigma. However, the symptoms led to more stigma than solely the label. Therefore, changing the name of the disorder may lower some of the stigma, but it will not efficiently eliminate it.

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PROJECT 35

HELENA SARGEANT

Centenary University, Class of 2025
Major: **Animal Health (Pre-Vet Track)**

Faculty Advisor: **Dr. YL Cha,** Assistant Professor of Biology
School of Natural, Health, Social and Behavioral Sciences

Hamster Anxiety, Memory, and Social Interaction Connections

Understanding the intricate interplay between anxiety, memory, and social interaction in rodent models is significant in the study of neurodegenerative diseases such as Alzheimer's and for exploring potential therapeutic interventions. In this study, we investigated the relationship between anxiety levels, memory performance, and social interaction in two groups of Hamsters: Group A, representing socially housed Hamster, and Group B, consisting of Hamster subjected to isolation.

Utilizing standardized behavioral assays, we assessed anxiety levels and memory performance in both groups. Our results revealed no relationship between anxiety and memory, while Group A demonstrated lower anxiety levels, the memory performance was equal to that of group B (2 buried marbles and 6 touches of the items in the memory box). Group B exhibited higher anxiety levels but didn't show much loss in the memory performance (1 buried marble and 6 touches of the items in the memory box).

Our finding suggest that social interaction may play a role in modulating anxiety but suggests there's more involved when it comes to the memory aspect, because marble burying behavior is indirectly related to memory. While the findings may not relate directly to disease model, it can help us look more in depth of anxiety factors among animal models.

In conclusion, our study contributes to the study aimed at elucidating the complex relationships between anxiety, memory, and social interaction in hamster models. Findings may help understanding and potentially treating neurodegenerative diseases and related disorders.

Independent Colleges Undergraduate Award Recipient 2024

Acknowledgments: Centenary University

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PROJECT 36

HARRIS SATTI
Saint Peter's University, Class of 2026
Major: **Biology and Chemistry**

VEDANT PRAJAPATI
Saint Peter's University, Class of 2024
Major: **Biology**
Minor: **Chemistry**

Faculty Advisor: **Dr. Yosra Badiei, Assistant Professor**
Department of Chemistry

Electrochemical Analysis of Ru-Immobilized Water-Splitting Catalysts for Clean Energy Production

In response to the urgent need for sustainable energy solutions, this research proposes a multifaceted approach to advance solar-to-chemical energy conversion. The focus is on the electrocatalytic water oxidation process, crucial for generating carbon-neutral hydrogen fuel. Our investigation aims to develop efficient water-oxidation catalysts (WOCs) with high activity and low overpotential. Drawing inspiration from natural photosynthesis, molecular catalysts, specifically Ruthenium-based complexes, are explored for their superior catalytic activity. An innovative aspect involves immobilizing these catalysts onto electrode surfaces using polymeric hydrogel, particularly poly(acrylic)acid (PAA), to enhance catalytic stability and mitigate solubility issues. Structural modifications are being pursued to optimize catalyst performance, especially in photo-electrochemical reactions with semiconductors like titanium dioxide (TiO2). Methodologies encompass catalyst synthesis, fabrication of photoelectrodes, and surface characterization using analytical techniques such as cyclic voltammetry and infrared spectroscopy. The structure-activity relationship by ligand modification will be explored to understand factors that affect the stability and binding of the molecular catalyst to the surface of the polymer. This research contributes to the global transition towards sustainable and environmentally friendly energy sources, promising a cleaner and brighter future.

Independent Colleges Scholarship Award: ***Novartis Science Scholar 2023-24*** *(De Fonseca Guedes)*

Additional Funding: STEM-PODER Grant Grant #P031C210076

Acknowledgements: **Carolina Da Fonseca Guedes, '25** (additional researcher)

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PROJECT 37

JOHNNELL SOLOMON-WEBB

Felician University, Class of 2024
Major: **Biology**

Faculty Advisor: **Dr. Alfredo Castro,** Associate Professor
Chemistry and Physical Sciences

UV Spectrophotometry of Artificial Sweeteners

Artificial sweeteners are synthetically manufactured sugar substitutes that do not increase caloric intake due to their immunity to metabolic degradation in the human body. There are currently six artificial ("high-intensity") sweeteners approved by the U.S. Food and Drug Administration (FDA): Saccharin, aspartame, Acesulfame potassium (Ace-K), Sucralose, Neotame and Advantame. These noncaloric sweeteners have gained immense popularity in recent years but remain controversial because of their suspected adverse tendencies to cause cancer or alter the body's ability to metabolize (natural) sugars.

In this project, the spectrophotometric properties of three commercially available artificial sweeteners were analyzed at 200-400nm: Saccharin or Sweet and Low, Aspartame or NutraSweet or Equal, and Acesulfame potassium (Ace-K) or Sweet One, before and after UV photodegradation in an alkaline aqueous solution. Of the three, only Saccharin showed no significant absorption, both Aspartame and Acesulfame potassium showed increased absorption as seen in the spectra at around 300 nm.

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Independent Colleges Undergraduate Research Award Recipient 2024

Independent Colleges Scholarship Award: ***Novartis Science Scholar, 2023-24***

Independent Colleges and Universities of New Jersey
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PROJECT 38

GABRIEL SORCI

Stevens Institute of Technology, Class of 2025
Major: **Physics and Pure and Applied Mathematics**

Faculty Advisor: **Dr. Igor Pikovski,** Professor in Theoretical Quantum Physics
Department of Physics

Quantum Atomic Clocks and Time Dilation

For over a century now, physicists have not understood how Quantum Mechanics and General Relativity fit together. Trapped ion atomic clocks offer a perfect avenue in which to explore how these two theories interface. These clocks are of the scale to which quantum effects need to be considered as well as time keeping devices that experience special relativistic time dilation. Due to the phenomena of time dilation, imprecision can be seen in these atomic clocks, which has yet to be explained through a full quantum optics formalism. When done correctly, using ideas pioneered by Igor Pikovski and Magdalena Zych in 2011, we expect to see a drop in visibility due to the coupling between the motional and clock degrees of freedom. We theoretically show that there is a quantum relativistic contribution to the imprecision of these clocks that is due to time dilation induced entanglement. Due to the high level of sensitivity that these atomic clock experiments are reaching, these effects that we explore are becoming more and more relevant. This paves the way for near future experiments that interface Quantum Mechanics and General Relativity.

Independent Colleges Scholarship Award: ***Novartis Science Scholar 2023-24***

Additional Funding: Stevens Institute of Technology

Acknowledgments: Dr. Joshua Foo, Postdoctoral Researcher, Stevens Institute of Technology

LIZA SUKHIJA

Fairleigh Dickinson University, Class of 2026
Major: **Computer Science, Data Science and Cybersecurity**
Minor: **Mathematics**

Faculty Advisor: **Dr. Neelu Sinha,** Professor
Department of Mathematics, Computer Science and Physics

Artificial Intelligence Application for Real World: Pima Indian Diabetes Dataset

In the sun-soaked lands of Arizona, the Pima Indian community faces a formidable adversary: Type 2 diabetes. This groundbreaking study pioneers a cutting-edge e-diagnosis system fueled by interpretable machine learning (ML) algorithms, set within the vast landscape of the Internet of Medical Things (IoMT). Armed with data from 768 women near Phoenix, Arizona, USA, including pregnancies, blood sugar tests, blood pressure readings, skin thickness measurements, insulin levels, BMI values, age data, and pedigree diabetes function, a journey akin to wrangling a herd of wild data points unfolds. The ML models—Naïve Bayes, random forest, and J48 decision tree—serve as trusty guides, illuminating the intricacies of diabetes diagnosis. As the exploration of the data trails progresses, the aim is to refine diagnostic accuracy, harnessing the power of technology to provide early interventions and personalized healthcare solutions. With each keystroke and algorithmic iteration, the study edges closer to a future where diabetes is no longer a daunting specter but a manageable challenge. Equipped with digital tools and determination, the research charges towards a horizon of improved health and well-being for the Pima Indian community and beyond.

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PROJECT 40

JAMANI THOMPSON

Caldwell University, Class of 2025
Major: **Chemistry and Secondary Education**

Faculty Advisor: **Dr. Marjorie Squires,** Associate Professor of Chemistry
School of Natural Sciences

Determining the Concentration of Potassium and Vitamin B6 in Conventional and Organic Bananas

In the U.S. low income, black communities are often food deserts where residents have little to no convenient options for buying healthy food, including organic produce. On average, organic products cost 47% more than conventional products in 2015. Organic produce may contain more antioxidants and types of flavonoids, which have antioxidant properties. Scientists were able to find that conventionally grown bananas contain approximately 0.209 mg of vitamin B6 and 329 mg of potassium. This research did not have any significant data on organically grown bananas nutritional value.

In this experiment, a titration method was used with some modifications for determining the concentration of potassium by precipitating with sodium tetraphenylborate and then back-titrating the excess reagent with a quaternary ammonium salt. The initial trials had to be modified to ensure that the pH was approximately 3.5 before titration for better indicator results (pale yellow to blue). When conducting the titration, it was noted that the color difference between standard and banana samples varied. The banana samples caused the solution to be much thicker, leading to the top layer only turning blue. This unfortunately made it hard to properly determine the end point. In addition, the different consistency of the banana samples compared to the standards indicates possible interference from other elements.

For both standards, two trials were conducted, with a fivefold increase in volume but the amount of potassium did not correspond. This indicated an inconsistency in the results of the titration from both standards. For conventional banana samples, the amount of potassium is below what would be expected for conventional bananas, which should have been approximately 329 mg for a whole banana. It was determined our samples yielded an average of approximately 46.08 mg per 40.25 g banana sample. For organic banana samples, it was determined that our samples yielded an average of approximately 92.59 mg per 40.25 g banana sample. Our tentative results show that organic bananas contain more potassium than conventional bananas.

Acknowledgments I would like to acknowledge the following: Independent Colleges and Universities of New Jersey Undergraduate Research Symposium, Caldwell University-Department of Natural Sciences

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PROJECT 41

SOPHIA WAYNER
Centenary University, Class of 2025
Major: **Pre-Vet Animal Health**

NICOLAS RADOVANIC
Centenary University, Class of 2025
Major: **Biology / Minor: Forensic Science**

Faculty Advisor: **Dr. YL Cha,** Assistant Professor of Biology
School of Natural, Health, Social, and Behavioral Sciences

A New Meaning to Bird Brain: Chicken color and shape associative learning

Over generations, chickens (Gallus gallus) have been artificially selected to produce copious amounts of products with the demand increasing each year. The fact inspired the questioning of a modern chicken's capacity to learn despite having only been bred to produce more and use their brain less. Backyard chickens have grown in popularity in recent years, leading to a variety of colors, hybrids, and selective breeding that also may affect a chicken's overall intelligence. This study observes a 1-year-old easter-egger laying hen in a backyard setting and their capacity for associative learning measured by the ability to pick out a red triangle among varying colors and shapes. Over a 7-day training period, the chicken was able to achieve a 90% success rate in choosing the red triangle in a group of triangles of other colors, beginning with only a 54% success rate on day 1. The chicken was able to achieve an 87.5% success rate in choosing the red triangle in a group of other red shapes (square, rectangle, circle), beginning with only a 15% success rate on day 1. Over the 7 days, both color and shape associative learning presented with a positive correlation of improvement. The chicken had an easier time differentiating the smooth shapes (circles) from the pointed shapes (triangles), achieving a 100% success rate by day 3. There was a decreased success rate when the chicken was presented with a triangle and square but improved when the chicken was presented with a triangle and rectangle, leading to the hypothesis that the chicken was better able to differentiate smooth curves from sharp angles. This hypothesis requires further testing. Based on the data, a chicken's ability to learn was accepted. While this study looks at the intelligence of a hybrid easter-egger breed raised in a backyard setting, there is a lot more research to investigate welfare concerns and changes in brain morphology and function in commercial and non-commercial breeds of chickens.

Independent Colleges and Universities of New Jersey

Administered Scholarships

…lessen the impact of rising tuition costs.
…offer students more time to focus on their studies.
…decrease loans needed to complete college.
…teach philanthropy.

Designated Scholarships

ICUNJ shares the scholarship criteria with its member colleges and universities who identify a student recipient who best meets the criteria and would benefit from a financial award.

CIC/UPS Scholarship *14 awards @ $3,000*
In 1974, the UPS Foundation established an educational program with the Foundation for Independent Higher Education to support students attending independent colleges and universities throughout the country. Fourteen UPS Scholars - one from each ICFNJ member institution - are designated each year.

Neil D'Amelio Memorial Scholarship* *1 award @ $2,000*
Created by family and friends, this endowed scholarship supports graduates of Secaucus High School who enroll full-time at Saint Peter's University. Preference is given to candidates who are business majors.

Deloitte Scholarship for Accounting Majors *4 awards @ $2,500*
Established in 2006, the Deloitte Scholarship for Accounting Majors recognizes and rewards high achieving students preparing for careers in public accounting. The scholarships help to address the challenge of making college affordable for all students.

Dr. Joseph V. Doria Scholarship* *1 award @ $2,000*
The scholarship is provided to a student in any year of study at Saint Peter's University who is eligible for financial aid.

Joseph V. Doria, Jr. Community Service Scholarship* *1 award @ $2,000*
Endowed in 1989 by friends and colleagues of The Honorable Joseph V. Doria, Jr., this scholarship is available to students enrolled at Mr. Doria's alma mater, Saint Peter's University. The Scholarship embraces service to education and the community.

Roland L. Lewan, Jr. Memorial Scholarship* *1 award @ $1,500*
Established in 1990 by Investors Bank as a memorial to their late president, this scholarship recognizes and rewards New Jersey residents based on ability and/or need.

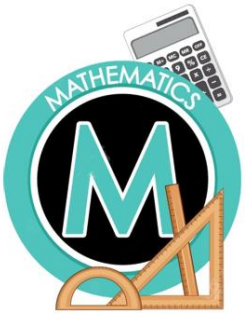
NJ Sales & Marketing Executives Association - Nicholas R. Vecchio Memorial* *1 award @ $1,500*
Awarded to a full-time student enrolled at an ICFNJ member college or university who is planning to pursue a career in sales and/or marketing.

NY/NJ Snowflake Youth Foundation Scholarship* *1 award @ $1,500*
Following Super Bowl XLVIII played on February 2, 2014, at MetLife Stadium at the Meadowlands Sports Complex in East Rutherford, New Jersey, the NY/NJ Snowflake Youth Foundation Scholarship established an endowed scholarship *"to provide opportunities for deserving students from this region" and to maintain the excitement of the Super Bowl in our area.*

Schering-Plough Undergraduate Research Scholarship* *14 awards @ $2,000*
Through an endowment, promotes the value of research by providing an award to undergraduate science majors who are conducting independent research projects.

Frank J. Tricarico Scholarship* *1 award @ $5,000*
Established in 1988, the scholarship recognizes and rewards deserving candidates attending Saint Peter's University who are pursuing careers in accounting.

John B. and Joyce Wilson Silver Anniversary Scholarship* *2 awards @ $3,000 | 1 award @ $1,000*
The endowed scholarship supports underserved and first-generation students addressing the financial stresses of a college education. The award will move to a different member college or university each year allowing students at every member institution to benefit from the scholarship over time.



Never ever give up on what you really want to do. The person with big dreams is more powerful than one with all the facts.

~ Albert Einstein

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Independent Colleges and Universities of New Jersey

Administered Scholarships

…lessen the impact of rising tuition costs.
…offer students more time to focus on their studies.
…decrease loans needed to complete college.
…teach philanthropy.

Competitive Scholarships

Scholarships are posted for all eligible candidates to apply. Candidates are selected based on the criteria with additional consideration given to financial need, as applicable, and institution enrollment.

BD Healthcare Scholarship *7 awards of $3,000*
Recognizes and rewards students who are planning careers in the healthcare industry. Scholarships are awarded on a competitive basis with opportunities for distribution at each member institution.

CohnReznick Accounting Scholarship *3 awards @ $2,000*
Established in 2006, this scholarship recognizes and rewards high achieving students preparing for careers in public accounting. The award was opened this year to all member institutions offering an undergraduate accounting degree.

Johnson & Johnson Nursing Initiative Scholarship *up to 5 awards per institution @ $5,000*
Addresses the growing nursing shortage in New Jersey by promoting nursing student advancement at the Independent Colleges and Universities of New Jersey. The scholarship supports both students in traditional 4-year degree programs and students who are returning to earn degrees through accelerated programs building on past college credits.

Kings Supermarket *1 to 3 awards @ $1,000*
This scholarship provides an opportunity for Kings' associates and their children who wish to attend one of the private colleges or universities in New Jersey to receive assistance. The purpose of the scholarship program is to attract and keep associates and to emphasize the importance of family by assisting the children of Kings' associates in the pursuit of their educational goals.

Nokia Bell Labs STEM Scholarship** *20 awards @ $5,000*
Established to support women and underrepresented minorities in STEM disciplines and to provide greater access to higher education

Novartis Science Scholarship *15 awards @ $3,000*
Recognizes and rewards undergraduate science majors at ICFNJ's member colleges and universities by awarding eight scholarships to high-achieving, qualifying students.

Novo Nordisk Scholars Program *5 awards @ $4,000*
The scholarships recognize outstanding students who demonstrate academic excellence while inspiring them to consider careers in diabetes research, education and treatment.

Partners for Health Foundation Nursing Scholarships *7 awards @ $7,500*
Introduced to fulfill the foundation's vision of making its 15 service communities healthier, better places to live. The scholarship advances undergraduate students at Bloomfield College, Caldwell University, and Seton Hall University who demonstrate a passion for caring for the community and commitment to advancing health care.

PNC - Barry Gillman Memorial Scholarship for Humanitarian Service *2 awards @ $5,000*
Created in 2009 in memory of a respected and beloved colleague, the scholarship honors the compassion and spirit of volunteerism by encouraging undergraduate students to continue in their humanitarian work while attending college.

PricewaterhouseCoopers - Martin R. Sullivan Memorial for Accounting Majors *3 awards @ $2,000*
Created in memory of the late Martin R. Sullivan, a partner at Coopers & Lybrand, the scholarship assists high achieving students to prepare for careers in public accounting.

PSEG Scholarship for STEM Majors *5 awards @ $2,500*
PSEG introduced this award to support exceptional students who share in their commitment to building environmental stewardship and developing meaningful sustainability initiatives.

Students are encouraged to visit https://njcolleges.org/icunj-scholarships-and-cost-of-attendance/ throughout the Spring , Summer and Fall semesters to check postings for scholarships and to review scholarship criteria. Many scholarships offered in the past may be available again for the 2024-25 academic year.

*Endowed Scholarships
**Introduced for 2024-25 academic year

ICUNJ Annual Presidents' Networking Reception

Cocktail Reception with Light Fare

June 11, 2024 4:30 p.m. to 7:00 p.m.

Rider University 2083 Lawrenceville Road
Lawrenceville, New Jersey

Join us for this once-a-year event
with leaders in private higher education

Our annual reception connects New Jersey industries, government and academia. Hosted by the Independent Colleges and Universities of New Jersey and the Presidents of New Jersey's thirteen independent colleges, the reception provides participants with an opportunity to interact with college decision-makers from student support to campus operations; finances to curriculum. Industry leaders who serve on the Board are also available for discussion while enjoying the beautiful collegiate setting of Rider University's suburban campus.

For sponsorship and ticket information visit
njcolleges.org/events.

NJ STEM Month is a celebration co-hosted by the **New Jersey STEM Pathways Network (NJSPN)** and **Research & Development Council of New Jersey** that highlights the Garden State's incredible accomplishments in science, technology, engineering, math and innovation.

NJ STEM MONTH

njstempathways.org/njstemmonth/

CREATING SCHOLARSHIPS - CREATES OPPORTUNITIES

Named scholarships offer funders a powerful tool to promote the next generation of an industry, to further social mission and corporate responsibility goals, or to give recognition to a person or promote a passion.

ICUNJ administered scholarships are crafted to meet the sponsor's objectives. Criteria are established and approved by the funder.

Scholarships are established at many financial levels. All scholarships help to address the cost of attendance allowing students to address the varied financial obligations associated with college including tuition.

Showcase your company with a named scholarship supporting independent college and university students in New Jersey.

Student Success

offering options in academic offerings and learning models, campus environments, student populations, and community engagement

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Discover why New Jersey independent colleges are educational opportunities worth exploring.

Independent Colleges and Universities of New Jersey

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