ARC

Academic Research Conference

MARCH 11-13, 2025

THE UNIVERSITY OF WEST ALABAMA

LIVINGSTON, ALABAMA

HYBRID (IN-PERSON ON UWA CAMPUS, USA, AND VIRTUALLY)

HOSTED BY

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March 11-13, 2025

The UNIVERSITY of WEST ALABAMA

LIVINGSTON, AL

SCHEDULE

13th Annual Academic Research Conference
March 11-13, 2025
All Time is Central Standard Time

March 11, Virtual Meeting

9:30 am – 9:50 am	**Welcome Remarks**
10:00 am – 12:00 pm	Business and Economics, Education, Engineering and Computer Science Poster Presentations
10:00 am – 12:00 pm	Health and Medicine Poster Presentations
10:00 am – 12:00 pm	Interdisciplinary and Social Sciences and Humanities Poster Presentations
10:00 am – 12:00 pm	Physical and Life Sciences Poster Presentations
12:00 pm – 1:00 pm	Break
1:00 pm – 3:00 pm	Business and Economics Oral Talk Presentations
1:00 pm – 3:00 pm	Education and Social Sciences and Humanities Oral Talk Presentations
1:00 pm – 3:00 pm	Education Professional Oral Talk Presentations
1:00 pm – 3:00 pm	Engineering and Computer Science and Mathematics Oral Talk Presentations
1:00 pm – 3:00 pm	Health and Medicine Oral Talk Presentations Session 1
1:00 pm – 3:00 pm	Health and Medicine Oral Talk Presentations Session 2
1:00 pm – 3:00 pm	Interdisciplinary Oral Talk Presentations
1:00 pm – 3:00 pm	Physical and Life Sciences Oral Talk Presentations Session 1
1:00 pm – 3:00 pm	Physical and Life Sciences Oral Talk Presentations Session 2
March 31	Announcement of awards for virtual sessions (by email)

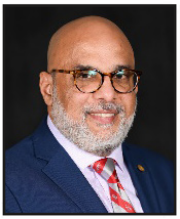
March 12, In-Person Meeting
UWA Campus Livingston, AL
Bell Conference Center

8:00 am – 8:30 am	Registration and poster setup
8:30 am – 8:45 am	Welcome Remarks
8:45 am – 9:00 am	Message from Dr. Andrea Mayfield
9:00 am – 9:45 am	Keynote by Rosie Zilinskas
9:45 am	Group Photo
10:00 am – 3:30 pm	Poster Session Competition and Exhibition
12:30 pm – 1:30 pm	Lunch and Networking
1:30 pm – 3:30 pm	Education, Engineering and Computer Science, and Social Sciences and Humanities Oral Talks
1:30 pm – 3:30 pm	Health and Medicine and Physical and Life Sciences Oral Talks
5:30 pm – 5:45 pm	Welcome Remarks
5:45 pm – 6:30 pm	Dinner
6:30 pm – 7:15 pm	Keynote by Neeti Jain
7:15 pm – 7:30 pm	Awards and Closing Remarks

March 13, In-Person
The Power of Storyteller Telling
UWA Campus Livingston, AL
Bell Conference Center

9:00 am – 12:00 pm	Workshop Part I
12:00 pm – 1:00 pm	Lunch and Networking
1:00 pm – 4:00 pm	Workshop Part II

ARC STEERING COMMITTEE



Dr. Mustafa Morsy
The University of
West Alabama

Dr. Melissa Haab
The University of
West Alabama

Danielle Miller
The University of
West Alabama

Dr. Tracy Keener
The University of
West Alabama

Dr. Kaleigh Pate
The University of
West Alabama

Haysley Gillespie
The University of
West Alabama

Chris Theriot
The University of
West Alabama

Dr. Gaungming Cao
Ajman University

Dr. Anouar Alami
Sidi Mohammed
Ben Abdellah

ARC TASK FORCE MEMBERS

Marketing

Dr. Melissa Haab	Student Affairs
Leslie White	Student Affairs
Kirstan Cunningham	Student Affairs
Cody Ingram	Institutional Advancement
Hannah Millwood	STEM Education

Finance and Fundraising

Chris Theriot	Institutional Advancement
Chris Lucas	Institutional Advancement
Danielle Haley	Liberal Arts
Dr. Dara Murray	Nursing
Dr. Andrea Mayfield	Rural Workforce Development

Program

Dr. Kaleigh Pate	Mathematics
Dr. Amanda Pendergrass	Education
Dr. Datta Narendra	Engineering Technology
Dr. Ethan Birney	History
Sidney Freeman	Biological & Environm Sciences

Logistics

Danielle Miller	Space and Project Admin.
Byron Thetford	Student Affairs
Troy Maddox	Student Affairs
Amanda Gilliland	Liberal Arts
Zachary Collier	Information Technology

Outreach

Dr. Tracy Keener	Biological & Environm Sciences
Gena Robbins	Career Services
Dr. Marti Herlong	Psychology/Sociology
Dr. Brian Keener	Biological & Environm Sciences

SPONSORS

Project Grow, funded by the Kern Family Foundation, focuses on developing school leaders of virtue and provides support to school leadership in developing and implementing a school plan aligned to the character framework to foster human flourishing and rural school transformation in 82 schools in the Black Belt, South Alabama, and East Mississippi regions. Project Grow developed a network, with a membership exceeding 600, forging relationships and connections between the University and school leaders through conversations and professional development. Project Grow's work with faculty to select virtues aligned to education professional dispositions, to provide training on the character framework and to lend support to the College of Education faculty (COE) in revising the curriculum in five programs, weaving character throughout. Project grow's logo reflects the College of Education's values in each petal.

The UNIVERSITY of WEST ALABAMA

BOSS

Biology Opportunities and Scholarships for Success II

The National Science Foundation (NSF) awarded $1.5M in scholarships to The University of West Alabama (UWA). The project will directly benefit undergraduate students throughout the next six years. The project title is **Biology Opportunities and Scholarships for Success II** (BOSS II). Students accepted in the program will receive an annual scholarship of $8,500, renewable for up to 4 years. The UWA BOSS II scholarship is designed to support students financially and academically to complete their college degree within four years, leading to a career in biological or environmental sciences or joining graduate or professional schools.

UWA TEACH

The primary purpose of **UWA-Teach** is to increase the number of STEM teachers in Alabama and diversify the teacher workforce. UWA-Teach offers four-year degree plans that fully integrate students' STEM content major requirements and UWA-Teach program requirements and allow students to obtain secondary STEM teaching certification while earning degrees in science, computer science, engineering, or mathematics. UWA-Teach prepares teachers with deep content knowledge and inquiry-based pedagogical strategies. The first two one-hour field-based courses allow students to try out teaching in a positive and supportive environment with no demand for a commitment to continue in the program. UTeach programs produce teachers at a lower cost than other leading programs, and our graduates stay in teaching longer, improve student performance in math and science, and influence students to enter STEM fields.

UWA The UNIVERSITY of WEST ALABAMA

CARES
Center for Achievement, Retention, and Enrichment Services

UWA CARES (Center for Achievement, Retention, and Enrichment Services) provides students access to centralized advising, mentoring, tutoring, workshops, open study hall, access to technology, and summer leadership camps. These services are provided free of charge to all students and are designed to assist students in overcoming barriers to achieving their academic goals. CARES uses a student-service-centered approach to provide support services, encourage participation in campus activities, and enrich the students' overall campus experience. UWA CARES is located in Spieth Hall 200 and is funded through a US Department of Education grant.

Alabama Power Company, headquartered in Birmingham, Alabama, is a company in the southern United States that provides electricity service to 1.4 million customers in the southern two-thirds of Alabama. It also operates appliance stores. It is one of four U.S. utilities operated by the Southern Company, one of the nation's largest electricity generators.

Alabama Power

UWA *Office of Sponsored Programs, Research & Outreach*

The **Office of Sponsored Programs and Research** (OSPR) is vital to the UWA campus. Located in Webb Hall, OSPR is a service division assisting faculty, staff, and students seeking external funds through proposal development and aid in managing awarded grants. OSPR is here to facilitate and enhance the grant writing process with experience and oversight. We want to help you do something that matters!

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-College of Natural Sciences & Mathematics-

TOMBIGBEE RC&D COUNCIL

SUMTER COUNTY FARMERS FEDERATION

UWA Cahaba Biodiversity Center

MESSAGE FROM THE ARC CHAIR

Dear ARC Participants and Guests,

Welcome to the 13th Annual Academic Research Conference (ARC) at the University of West Alabama (UWA). This event reflects hundreds of hours of innovative research, mentorship, and academic achievement.

What began as a small campus gathering has become a thriving international conference featuring presenters from 34 institutions across 12 countries. This remarkable growth reflects UWA's unwavering commitment to fostering student's research excellence. The ARC showcases diverse presentations spanning the sciences, humanities, education, business, and technology—each telling a unique story of curiosity, perseverance, and discovery. I encourage you to attend multiple sessions, engage with presenters, and explore new perspectives throughout the day.

In celebration of Women's History Month, we are honored to welcome two distinguished keynote speakers: Rosie Zilinskas, CEO of *No Women Left Behind* and host of the *Women in Leadership* podcast, who brings over 30 years of corporate leadership experience and will share strategies for career growth, job searches, and confidence-building; and Neeti Jain, strategic partnerships advisor at NYC's Mayor's Office of Food Policy and leader of the *Plant-Powered Carbon Challenge*, who, with degrees from Yale and the University of Chicago, will discuss how professionals can craft compelling narratives to drive change.

We thank our international co-hosts—Ajman University (UAE) and Université Sidi Mohammed Ben Abdellah-Fès (Morocco) for enriching ARC with global perspectives. These collaborations strengthen our international connections and foster innovation across borders.

This conference is made possible by the dedication of our Steering Committee, task forces, moderators, and judges. We also thank UWA and Tombigbee RCD for their generous support.

Whether presenting, mentoring, or attending, your participation strengthens the academic spirit that defines UWA and ARC.

Sincerely,

Dr. Mustafa Morsy
ARC Chair and co-founder

MESSAGE FROM UWA PROVOST

Dear ARC Participants and Guests,
I have been privileged to watch the growth of the Academic Research Conference grow from a small event that within a single academic to a unit to a conference that extends across not only campus but across international borders. As Provost, I am thrilled to see the cross-disciplinary collaboration that ARC encourages at the University of West Alabama.

ARC builds on UWA's commitment to provide hands-on learning opportunities, networking experiences, and personal growth epiphanies in different ways. I know that through this conference, you will witness firsthand the passion, these presenters have for their work. And, you will walk away enriched for the experience.

I encourage you to attend as many sessions as possible, so that you can meet, engage and become part of this wonderful community of learners. I promise they want to share their insights with you and hear what you have to say about their work.

We extend our special thanks to our international cohosts—Ajman University (UAE), Université Sidi Mohammed Ben Abdellah-Fès (Morocco), and HCMC University of Technology and Education (Vietnam)—for enriching ARC with a truly global perspective.

I would be remiss if I did not express my gratitude to the 2025 ARC Steering Committee and their individual tasks forces. While the conference lasts two days, these individuals have worked untold hours bringing everything together so that you might have the best experience possible. In addition, I wish to thank the volunteers who have agreed to serve as session moderators and judges. Their work is also greatly appreciated.

Finally, I wish to thank you for taking the time to be here and joining our academic community. Your dedication and excitement inspires us. We are a stronger and more vibrant institution because of you.

Sincerely,

Tina Naremore Jones

Tina Naremore Jones, Ph.D.

MESSAGE FROM UWA PRESIDENT

Greetings!

On behalf of the University of West Alabama, we thank you for your participation and invaluable contribution to the Academic Research Conference. This event brings together an exceptional array of scholarly interests, showcasing your commitment to your respective fields of study and emphasizing the importance that research in higher education has on our society. No matter the scale of focus, we can be certain that scholarly research has a positive impact on virtually every aspect of life, and it is an incredible honor to witness the development and continuation of your dedication to innovation and achievement.

At UWA, we believe the value of experience gained through a scholarly diverse academic community is immeasurable. We are deeply proud of our own scholars, and we welcome our guests as part of this community through participation in ARC. In seeking to answer questions and offer solutions through research, we exhibit intellect, empathy and collaboration to advance and strengthen all that we do.

It is our pleasure to host this conference as a way of sharing our University community's scholarly achievements and pursuits while welcoming insights, developments, and findings of scholars from around the globe. May we each remain devoted to the scholarly work that we know can profoundly impact our society through discovery.

Sincerely,

Todd G. Fritch, Ph.D.
UWA President

MESSAGE FROM USMBA PRESIDENT

It is with great pleasure that our university co-organizes this scientific event with renowned universities. I wish a rewarding and fruitful scientific gathering to all participants of the University Research Conference (ARC2025), which will be held from March 11 to 13, 2025, on the University of West Alabama campus in Livingston, as well as virtually.

Our university is heir to the oldest university in the world ("Qaraouine University"). The modern version of the Sidi Mohamed Ben Abdellah University of Fez dates back to 1975. We are located on 3 campuses and have 13 establishments in various disciplines, including humanities, social sciences, engineering, sciences and technology, medical sciences, business and management, and sport. We offer almost 300 study programs covering all disciplines.

Over 100.000 students are enrolled in our institutions, including almost 2.000 international students (from 70 countries), more than 1.700 faculty and research staff in 80 research laboratories, and more than 6.000 doctoral students. Our scientific output is around more than 2600 publications per year.

We are delighted that this conference was also co-organized this year with the University of West Alabama, USA, within the framework of the Memorandum of Understanding between the University Sidi Mohamed Ben Abdellah-Fez and the University of West Alabama-USA, signed in Fez on September 2, 2022, as well as with the University of Ajman-United Arab Emirates. This important collaboration provides our doctoral students an opportunity to share knowledge, exchange innovative ideas, and develop valuable academic relationships.

We look forward to highlighting the notable work of doctoral students and teacher-researchers at Sidi Mohamed Ben Abdellah University. Our sincere thanks to all participants for their commitment and contribution to the development of varied and stimulating research.

I would like to conclude by wishing all participants every success and achievement in their work during this major conference, hoping that it will be part of a lasting dynamic of collaborations and future scientific meetings.

Sincerely,

Mustapha IJJAALI, President
Sidi Mohamed Ben Abdellah University of fez - Morocco

At the heart of the "No Woman Left Behind" initiative is **Rosie Zilinskas**, a beacon of hope and empowerment for women navigating the corporate world. More than just an advocate, Rosie is a Certified High-Performance Coach who pours her passion into transforming the professional lives of women. Her vibrant brand is a treasure trove of resources, featuring the uplifting "No Woman Left Behind" podcast, personalized career-building services, a warm and supportive mentoring community, and insightful consultancy. Rosie's nurturing voice also shines in the bestselling book, "Engaging Speakers – Voices of Truth," where she shares her wisdom and encouragement. Rosie believes wholeheartedly in the transformative power of confidence and a strategically crafted career roadmap. With her empathetic guidance, she helps women navigate and surmount professional challenges. Her engaging bilingual storytelling and educational programs are not just about helping women gain well-deserved recognition in the corporate world; they're about bridging the gender gap and fostering a more inclusive environment. Her own experiences inform these efforts as an

Executive Vice President at a Fortune 500 insurance company, where she witnessed women's often-overlooked talents and potential in the workplace. With a rich tapestry of over thirty years in corporate leadership, Rosie brings a depth of understanding and a personal touch to her coaching. Rosie's mission is deeply personal and far-reaching: she's not just shaping successful careers. She's nurturing a more empowered, equitable society and inspiring a generation of women to step into their power and brilliance in the world.

KEYNOTE SPEAKERS

Neeti Jain is an environmental scientist and environmental justice practitioner, currently serving as a Strategic Partnerships Advisor in the New York City Mayor's Office of Food Policy. As an NSF Graduate Research Fellow at the Yale School of the Environment, her work focused on promoting justice-centered storytelling at leading natural history museums and has been featured in museum journals and WNPR. An educator at heart, Neeti is an adjunct faculty member at New York University, in addition to teaching workshops with the Story Collider.

The Power of Storytelling Workshop
March 13 (9:00 am – 4:00 pm)

The Story Collider will provide an interactive keynote address on March 12, exploring the science of storytelling through communication studies, psychological science, and social neuroscience. Participants will discover why stories matter, what makes narratives compelling, and the physical and mental health benefits of storytelling and story listening. Beyond theoretical knowledge, attendees will gain practical tips for crafting authentic personal narratives designed to entertain, persuade, or inspire audiences.

Building on the keynote foundation, our hands-on workshops guide participants through developing their own science-based personal stories in the style featured on our weekly podcast. These sessions address crucial storytelling questions: How do you identify meaningful stories from your experiences? What universal elements do compelling stories share? How can you integrate scientific concepts accessibly? Participants will practice their narratives, receive expert feedback, and develop confidence as science communicators. These workshops demonstrate how storytelling enhances personal growth and professional development in scientific fields. Two renewed speakers will present the workshop.

Grant Bowen | Producer - New York City
Grant Bowen is an accomplished storyteller featured at prestigious venues, including The Moth, The Story Collider, and numerous NYC storytelling shows. He co-produced the award-winning monthly show "Awkward Teenage Years," showcasing stories from adolescence. His solo performance, "A Public-Private Prayer," has been featured in multiple theater festivals across NYC and at Ursinus College in Pennsylvania. Grant's extensive acting credits include productions with Vital Theatre Company, Infinity Theatre Company, and Theatreworks USA. As a playwright, his full-length work "Late Night Odyssey" received a staged reading at the 2018 Broadway Bound Theatre Festival, while his one-act play "Lay Down My Sword and Shield" was entirely produced by Articulate Theatre Company.

Jitesh Jaggi | Senior Producer - Chicago
Jitesh Jaggi, an Indian immigrant now based in Chicago, transitioned from finance to storytelling after a pivotal moment involving lost Excel data made him realize his true calling. Now working on a book of essays, Jitesh has established himself as a two-time Moth StorySlam winner and producer for The Story Collider. He coaches both individuals and corporate clients in storytelling techniques. Jitesh approaches his work humorously and can be easily persuaded by books and chocolates.

CONFERENCE CODE OF CONDUCT

In order to establish a productive academic environment, all participants in the Academic Research Conference agree to abide by the following code of conduct.

1) In the field of Research and Academic Integrity I shall
   a) Be accurate in gathering and assessing information.
   b) Be accurate in formulating conclusions.
   c) Create presentations both written and oral with a goal of communicating what was learned and what areas of doubt remain.
   d) Be sure to appropriately credit others for their research and ideas.
2) When interacting with other Conference participants, I shall
   a) Make every reasonable effort to respect my audience's time by
      i) Sticking to a timeline and
      ii) Having a thoughtful presentation
   b) Engage with questions and feedback by accepting them as well-intentioned attempts to further knowledge.
   c) Offer full attention when attending presentations.
   d) Ask questions and offer feedback in a way designed to promote growth by the speaker and other audience members.
3) In general, I shall follow the policies of the ARC and follow all relevant laws.

Violations of this Code of Conduct may result in consequences including, but not limited to:

1) Formal warnings
2) Removal from conference sessions
3) Revocation of participation privileges in future ARC events
4) Reporting serious violations to relevant institutions or authorities

TABLE OF CONTENTS

March 11, 2025
Virtual Event

BUSINESS AND ECONOMICS, EDUCATION, ENGINEERING AND COMPUTER SCIENCE, PHYSICAL AND LIFE SCIENCE POSTERS

10:00 am – 12:00 pm

*Undergraduate Presentations **Graduate Presentations

Zoom Link

Moderators: Tracy Keener and Gena Robbins

1. ***Multi-Frequency Exciter Instrument for Diabetic Neuropathy Assessment (Dia-Sens)**

Basel Semsam

Department of Biomedical Engineering, Ajman University, Ajman, UAE

The Vibrotactile Perception Threshold (VPT) test is a clinical measure used to assess the function of skin mechanoreceptors that can detect vibrations. It provides a non-invasive indicator for diagnosing Diabetic Peripheral Neuropathy (DPN). The goal of this project is the design and development of an instrument (Dia-Sens) that will deliver vibration stimuli for determining VPT. The instrument works by generating vibration stimuli applied to the fingers or feet of the subject and receiving his/her response when the stimulus is felt via a button. For this purpose, an electromechanical exciter is used that delivers vertical motion to a probe that comes into contact with the skin of the subject. The stimuli can vary in frequency (4 Hz, 8 Hz, 16 Hz, 32 Hz, 64 Hz, 128 Hz, 256 Hz, and 512 Hz) as well as acceleration (intensity) (60 dB – 150 dB). The instrument uses psychophysical algorithms that comply with international standards. These include the up-down algorithm which uses discrete adaptive steps based on the subject's binary responses to quickly converge on the threshold level, and the von Békésy method which involves a continuous sweep of the stimulus intensity with the subject's ongoing feedback, from which the threshold is determined by averaging several points. Moreover, the literature indicates that excessive pressure applied to the probe may affect the VPT value. To address this problem, a pressure sensor is used to measure the pressure on the probe and alert the user if it's above normal. We have successfully developed the adjustable frequency and intensity part of the instrument and we are currently working on programming its microcontroller to execute the aforementioned VPT measuring algorithms before we can proceed to the testing phase. We believe that Dia-Sens will contribute towards the early diagnosis of DPN, which will lead to better management of this condition.

Keywords: Diabetic Peripheral Neuropathy, Vibration Perception Threshold, Von Békésy Algorithm, Up-Down Method, Multi-Frequency Excitation.

2. Empowering rural women through the promotion of entrepreneurship

Najoua Khayati and Abdelali Lahrech

Laboratory of Research in Organizational Management, Faculty of Legal, Economic and Social Sciences of Meknès, B. P. 3102 Toulal, Meknès, Morocco

Promoting entrepreneurship provides a strategic framework for socio-economic development. It is, however, faced with multiple constraints such as access to resources, funding, and social disparities. This is particularly highlighted in the case of rural women who endure several adversities if they opt for the entrepreneurial path.

The purpose of our research is to identify the various programs implemented in Morocco to promote female entrepreneurship in rural areas. We also aspire through our work to provide a clear understanding of the impact of such initiatives on the empowerment of women and their social and economic inclusion.

Using a qualitative approach, we set out by carrying out a thorough analysis of reports, documents, and working papers related to several programs aimed at promoting female entrepreneurship in Morocco. Subsequently, we conducted semi-structured interviews with entities involved in the implementation and evaluation of these programs.

Our preliminary findings underline the significant impact of entrepreneurship-promoting programs on women's empowerment, particularly in rural settings. Moreover, they allow for a comprehensive analysis of the factors that lead to their success. Conversely, our results demonstrate that despite the positive results, progress remains slow. Its acceleration requires more efforts to overcome cultural barriers and stereotypes as well as constraints related to access to training, resources, and business networks.

Our work enriches the knowledge on rural women's empowerment through the promotion of entrepreneurship. It emphasizes the impact of female entrepreneurship programs on overcoming the cultural, social, and economic challenges they face to implement and succeed in their entrepreneurial endeavors. Moreover, the preliminary results obtained serve as a basis for further investigation on factors that contribute to the success of such initiatives. They also invite policymakers and authorities to conduct a deep reflection on means to introduce more inclusive
policies in rural communities.

Keywords: empowerment, rural women, entrepreneurship programs

3. Stacking Method for Accurate Prediction of Traffic Accident Severity Using Machine Learning Models

Imad El Mallahi[1*] and Hajar Zerriq[2]

1 Sidi Mohamed Ben Abdellah University, Faculty of Sciences Dhar El Mahraz, Laboratory of Computer Science Signals Automation and Cognitivism, Department of Computer Science, Fez 30000, Morocco.

2 Sidi Mohamed Ben Abdellah University, Ecole Normale Supérieure, Department of Mathematics and Computer Science, Fez , Morocco.

Road traffic accidents have become a major cause of fatalities globally, especially in the transportation and logistics industry. The number of deaths from these accidents is rising rapidly every day. Therefore, it is crucial to develop early prediction methods that can inform drivers and riders about accident statistics specific to their region. This includes considering factors such as speed limits, adherence to traffic signals, pedestrian crossings, right of way, weather conditions, negligence, fatigue, and the impact of excessive speed on road traffic accidents. By being aware of these factors, people can exercise caution and help reduce the occurrence of traffic accidents. The stacking method for enhancing the classification of road traffic accident severity using machine learning models presents several interesting points. Firstly, it offers a promising approach to tackle the challenges associated with accurately classifying accident severity, such as imbalanced datasets and high-dimensional features. By combining the predictions of multiple base models, the stacking method creates a meta-model that improves classification performance. This ensemble approach allows for the exploitation of diverse model strengths, capturing different aspects of the data and enhancing the overall predictive power. Additionally, the selection of appropriate base models plays a crucial role in the success of the stacking ensemble. The chosen models should possess complementary strengths and provide robust predictions. Moreover, effective feature engineering and selection techniques can further enhance the performance of the stacking method. Within the field of artificial intelligence, several machine learning prediction approaches have been explored to provide decision support in addressing this road traffic accident dilemma. These methods aim to generate accurate reports on these issues. However, the current stacking method approach has achieved significantly higher performance compared to other related works.

Keywords: Road traffic crashes, Machine Learning, transport and logistics, Classifiers.

4. Flow cytometric and microscopic evaluation of apple (Malus domestica) seedlings from interploid crosses

Monika Działkowska, Danuta Wójcik, Agnieszka Marasek-Ciołakowska, Mariusz Lewandowski, and Małgorzata Podwyszyńska

The National Institute of Horticultural Research, Poland

Polyploidization, the process of increasing the number of chromosome sets, is a key tool in plant breeding, as it allows for the development of plants with desirable traits, such as increased disease resistance, improved fruit quality, and greater genetic diversity. Interploid crosses, particularly between diploids (2x) and tetraploids (4x) Malus domestica, result in the formation of triploid seedlings (3x), which may possess these traits. The aim of this study was to evaluate the cytometric and microscopic characteristics of seedlings obtained from such crosses. Crossing parents with different ploidy levels results in seedlings with varying ploidy levels, which can influence various morphological, physiological, and adaptive traits of the plants. Cytometric analysis, conducted using flow cytometry, enabled the precise determination of ploidy levels and genome size of the progeny. For diploid genotypes, the genome size ranged from 1.59 pg to 1.62 pg, while tetraploids exhibited a higher DNA content, ranging from 3.05 pg to 3.18 pg. Triploid seedlings had DNA content ranging from 2.31 pg to 2.59 pg, which falls between the values for diploids and tetraploids. Microscopic analysis, aimed at evaluating the number of chromosomes in the seedling cells, showed that the number of chromosomes in the metaphase nuclei of triploid seedlings was 51, which is an intermediate value between diploids and tetraploids confirming their ploidy. The results of this study provide valuable insights into the effects of ploidy and polyploidization on seedling development, including their morphological and physiological traits, which could be important for future breeding programs aimed at improving fruit quality, stress resistance, and genetic diversity in Malus domestica.

5. Synthesis and Characterization of new N-tosylated Tri-(1,2,3-Triazole) Derivatives via the Copper-Free Huisgen Cycloaddition

Y. Aouine[1,2] and A. Alami[2]

1 Team of Organic Chemistry and Valorization of Natural Substances, Faculty of Sciences, Ibnou Zohr University, Agadir 80060, Morocco

2 Engineering Laboratory of Organometallic, Molecular Materials, and Environment (LIMOME), Faculty of Sciences Dhar El Mahraz, Sidi Mohammed Ben Abdellah University, Fez 30000, Morocco

In the new novel drug discovery and development process, nitrogen-containing hetero-aromatic scaffolds are more attractive due to their diverse biological receptors and high degree of binding ability. 1,2,3-Triazole core, a five-membered nitrogen heterocycle core with three nitrogen atoms and two carbon atoms, is a potential heterocyclic component in a wide range of drug scaffolds. The core has a substantial impact on biological activity.

We described in this communication the preparation of new N-tosylated tri-(1,2,3-triazole) derivatives via the copper-free Huisgen cycloaddition reaction. In each reaction, two regioisomers were obtained, whose purification was performed using chromatography on a silica gel column. The obtained products were characterized based on NMR spectroscopy (1H,13C, 15N and 2D 1H-15N HMBC) in addition to the elemental analysis and MS data.

Keywords: Huisgen cycloaddition reaction; 1,2,3-triazole

6. Nature-inspired MPPT algorithms for solar PV

Youssef Laaouaj

Laboratory of Mathematics and Applications to Engineering Sciences, Bensouda FES, 30000, Morocco

In recent years, renewable energy attracts the researchers interest due to its environment free nature and abundant availability. Solar photovoltaic (PV) is widely used to generation power from the sun light. Major issue in solar PV power generation is tracking of the peak power from the available multiple power peaks in the operating points. A proper MPPT algorithm is required to capture the maximum power point (MPP) from the characteristic curves of a solar PV under partial shaded conditions (PSC). An optimized maximum power point tracking (MPPT) and fault classifcation in solar PV systems are presented in this research work. To select the best optimization model for MPPT the nature-inspired Gray Wolf Optimization (GWO), Horse Herd Optimization (HHO) and Whale Optimization Algotithm (WOA). are used in this work to evaluate the tracking efciency (TE) of the solar PV systems.

7. Surveillance and identification as key elements for the management and protection of citrus trees against “Protopulvinaria pyriformis” (Cockerell, 1894) (Hemiptera: Coccidae)

I. Mrabti[1,2], H. Benzahra[1,2], H. Grijja[1,3], S. Ait Baddou [1,2], M. Afechtal[1], N. Brhadda[2] and R. Ziri[2]

1 Laboratory of Virology, Regional Center of Agricultural Research of Kenitra, National Institute of Agricultural Research, 14000 Kenitra, Morocco.

2 Laboratory of Plant, Animal, and Agro-Industry Productions, Faculty of Sciences, University Ibn Toufail, Kenitra, Morocco.

3 Laboratory of Entomology, Regional Center of Agricultural Research of Kenitra, National Institute of Agricultural Research, 14000 Kenitra Morocco.

In the coastal areas of north-western Morocco, a field survey was conducted between the spring of 2023 and the autumn of 2024 in 43 sites from four provinces in order to detect the presence of scale insects (Hemiptera : Coccomorpha), on citrus trees. A particularly concerning species, the pear-shaped scale Protopulvinaria pyriformis (Cockerell, 1894) (Coccidae), was identified at four sites. This is the first study to report this species on citrus crops in Morocco, providing a detailed description based on the analysis of 62 adult females. Although P. pyriformis is not currently causing significant damage to citrus crops, it is crucial to recognize its potential to become a threat to other fruit crops, such as avocados. This study highlights the importance of proactive monitoring of P. pyriformis populations to prevent their spread to other regions and crops.

As part of environmental protection and sustainable agriculture, the presence of natural predators was noted, such as the ladybird Chilocorus bipustulatus (Linnaeus) (Coleoptera: Coccinellidae) and two parasitic wasps, Aphytis sp. (Hymenoptera: Aphelinidae), as well as an unidentified endoparasitoid (Hymenoptera: Chalcidoidea). This coexistence emphasizes the importance of preserving biodiversity within agricultural systems, thereby promoting biological pest management and reducing the use of chemical pesticides to maintain ecological balance.

Keywords : Protopulvinaria pyriformis, citrus crops, avocado trees, Morocco, agriculture

HEALTH AND MEDICINE POSTERS

10:00 am – 12:00 pm

Zoom Link

Moderators: Chris Theriot and Nancy Brooker

*Undergraduate Presentations **Graduate Presentations

8. *Unlocking the Power of Green Algae Metabolites: A Breakthrough in Analysis and Future Innovations

Mohammed Khalifah

University of Hertfordshire Hosted by Global Academic Foundation, Egypt

Algae, a diverse group of photosynthetic organisms, are a rich source of specialized metabolites (SMs) with significant potential in pharmaceuticals, bioenergy, and industrial applications. Despite their promise, algae remain underexplored due to challenges such as complex chemical structures, limited genomic data, and a lack of specialized tools for analyzing their biosynthetic pathways. This study aims to bridge this gap by leveraging advanced genome mining techniques to identify novel SMs and their associated biosynthetic gene clusters (BGCs) in 29 algae species, with a focus on the *Trebouxiophyceae* family of green algae.

Using publicly available genomic data from the National Center for Biotechnology Information (NCBI), we employed a suite of bioinformatics tools, including antiSMASH and GECCO, to predict and analyze BGCs. The results were visualized using tools such heatmaps generated in R, enabling a comprehensive exploration of the metabolic potential of these understudied organisms. Our findings revealed several novel SMs with potential applications in medicine, bioenergy, and industrial biotechnology. For example, we identified metabolites that have metabolic pathways shared by bacteria as well as compounds that could contribute to sustainable biofuel production.

This research highlights the untapped potential of algae as a source of valuable natural products and underscores the importance of advancing genome mining tools tailored for algae. By uncovering novel SMs and their biosynthetic pathways, this study contributes to the growing field of natural product discovery and demonstrates the potential of algae to address critical challenges in healthcare, sustainability, and industry.

Keywords: Algae, Specialized Metabolites, Genome Mining, Biosynthetic Gene Clusters, Bioinformatics, Natural Products

9. *Effective Medical Multiple Choice Question (MCQ) Design: Best Practices and New Approaches in generating MCQs

Fathima Valayath, Sinclair Steele, Niranjan Nayak, Yehia Mohamed, and Debadatta Panigrahi

Ajman University, UAE

Objective:
The purpose of this study is to review and recommend best practices for generating high-quality MCQs in medical education, focusing on assessing students' knowledge at an analytical level rather than a linguistic one. It addresses common pitfalls in MCQ design and explores innovations such as faculty training, student involvement, and AI to create more effective questions for medical students.

Methods:
A literature review was conducted, analyzing studies on MCQ generation in medical education. Innovations such as: faculty training programs, student involvement in MCQ creation, and the application of AI tools like ChatGPT, Bard, and Microsoft Bing were used for evaluation. The difficulty and discrimination indices were used as key metrics to assess MCQ quality. Examples of poorly designed and well-constructed MCQs were compared, and long-term faculty workshops were examined for their effectiveness in improving question quality.

Results:
The study found that MCQs generated by faculty improved significantly in terms of homogeneity and quality after participating in long-term workshops, reducing item writing flaws. Student-generated MCQs, when guided, demonstrated high cognitive challenge and engagement. AI-generated MCQs varied in quality, with ChatGPT producing the most difficult and more accurate questions but still requiring human oversight. Questions with difficulty indices between 50-60% and discrimination indices above 0.25 were found to be the most effective.

Conclusions:
The findings highlight the importance of ongoing faculty training, structured student involvement, and careful analyses of AI-generated MCQs in producing high-quality questions. These practices are essential for maintaining the validity and fairness of assessments in medical education. By adopting these approaches, medical educators can significantly enhance the reliability and effectiveness of MCQs as a tool for student evaluation.

10. *Eucalyptus Camaldulensis Essential Oils through Hybridization and Rectification: A Chemometric Study

Aabassi Fatima Ez-zahra, Fadil Mouhcine, Mechatte Mohamed Amine, Saffaj Taofiq, and Farah Abdellah

Laboratory of Applied Organic Chemistry, Faculty of Sciences and Techniques, University Sidi Mohammed Ben Abdellah, B.P. 2202, Fes 30000, Morocco

To enhance the value of Moroccan aromatic, therapeutic plants and to guarantee increased productivity and long-term sustainable resource management, this work focused on both the chemical composition characterization and rectification as a deterpenation method of Eucalyptus natural hybrid clone 583 essential oil. The Seven fractions of this oil were analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) and evaluated for deterpenation interpretation. The data from this study were processed by statistical analysis principal component analysis (PCA). The essential oil of clone 583 is characterized by a high dominance of 1.8-cineole (84.93%) compared to that of the parent species Eucalyptus camaldulensis (42.3%). The rectification has a significant effect on the deterpenation of Eucalyptus natural hybrid essential oil fractions. The PCA results demonstrated that the first three fractions present the highest performance and quality of the essential oil, F1 from 0 to 10 min (95.45 %), F2 from 10 to 20 min (96.96%), and F3 from 20 to 30 min (97.81%). The results of this research show how to get the highest yields of oils rich in 1.8-cineole and α-pinene chemo-types, which might have a beneficial economic influence on the exploitation of Eucalyptus.

Keywords: Clone 583, Chemical Composition, Deterpenation, Rectification

11. *New Isoxazole Derivatives: Design, Synthesis, Crystal Structure, Antimicrobial Assessments

Aziz Arzine[1], Yassine Rhazi[2], Najoua Barghady[1], Mohammed Chalkha[2], Asmae Nakkabi[2], Mohamed Bakhouch[3], and Mohamed El Yazidi[1,*]

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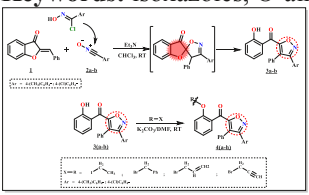
Prior to the discovery of penicillin in 1929, bacterial infections caused significant global mortality, but since then, overuse of antibiotics has led to widespread drug resistance, which will be responsible for 4.95 million deaths in 2019[1,2]. Fungal infections, particularly Candida and Aspergillus, cause over 1.7 million deaths annually, with Candida albicans responsible for most severe cases, underscoring the urgent need for new treatments[3,4]. Isoxazole derivatives, part of a promising class of heterocyclic compounds, exhibit diverse biological activities, including antibacterial and antifungal effects. In addition to medical applications, they are used in agriculture and industries such as corrosion protection and dye production, demonstrating their broad utility[5–7]. Considering the aforementioned significant biological applications of isoxazoles, and in line with our ongoing research on the development of new heterocyclic compounds[8,9], this study focuses on the synthesis of new isoxazole (*scheme. 1*), derivatives as well as the evaluation of their antimicrobial properties through both *in vitro* investigations (*figure. 1*).

Keywords: isoxazoles, O-alkylation, crystal structure, antimicrobial activity



Scheme 1: alkylation route for the precursors 3a-b

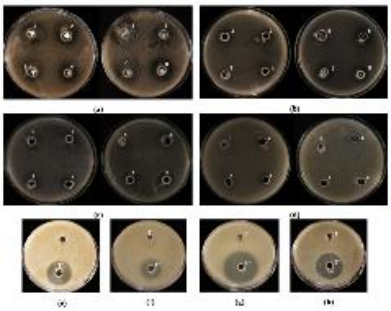


Figure 1: Photographs showing the effectiveness of **4a-h** against *(a): C. albicans, (b): E. coli, (c): B. subtilis and (d): S. aureus*. e, f, g and h represent the controls of *C. albicans*, *E. coli, B. subtilis and S. aureus* respectively; T+: Positives controls (amphotericin B and ampicillin for *C. albicans* and bacteria growth respectively)) and T-: Negative control (DMF). Each well was subjected to 156 µg of compound or positive control, while the negative control was tested at 100 µL.

12. A Cross-Sectional Observational Study on Quality-of-Life Assessment in Elderly Patients with Diabetes: Evaluating Quality of Life and Exploring Contributing Factors, in Meknes, Morocco

Nawal Elomari

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Aging of the population is projected in all countries worldwide. This increasing life expectancy is partly linked to the growing prevalence of diabetes among elderly people. This disease has become a major public health concern worldwide and Morocco is no exception. Diabetes is often associated with numerous complications that affect not only patients' physical health but also decrease quality of life. This quality of life is influenced by several factors: medical, psychosocial, economical… Indeed, various studies have addressed the impact of diabetes on quality of life, but without considering this vulnerable population. It is essential to understand how diabetes affects the daily lives, mental well-being, and physical abilities of elderly individuals. The objective of this research is to examine the quality of life among elderly diabetic patients and explore the main factors influencing it, by using validated scales and instruments. Approximately 250 participants will be recruited through convenience sampling, with eligibility criteria including individuals aged 60 years and over with diabetes. The study will be conducted in healthcare facilities and hospitals. In the absence of complete data, we hypothesize that patients with Type 2 diabetes will report lower overall quality of life compared to those with Type 1 diabetes, due to a higher prevalence of complications and comorbidities. We also expect that socio-demographic factors, such as lower educational attainment and limited social support, will relate with poorer quality of life outcomes. To address this issue, our study adopts an observational, descriptive, and analytical cross-sectional design. Data collection involves administering validated questionnaires measuring quality of life, diabetes-related complications, and socio-demographic characteristics. Ethical considerations will be strictly observed. The goal of this research is to help healthcare professionals and policymakers to implement programs to treat adequately diabetes, to enhance the well-being of this vulnerable population.

Keywords: diabetes, elderly people, quality of life

13. Quality of Life of People Living with HIV in Morocco: Insights from the Meknes Region

Fatima Zahra and Anouar Tadlaoui

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Morocco has made significant progress in its national HIV/AIDS strategy, achieving a 35% reduction in new cases and a 53% reduction in mortality between 2010 and 2023. However, people living with HIV (PLHIV) continue to face challenges related to quality of life, particularly in the context of extended life expectancy due to antiretroviral treatment. There is a notable research gap regarding the quality of life of PLHIV in Morocco, especially in the Meknes region, which this study seeks to address. The primary objective is to explore the socio-economic, psychological and medical factors that influence the quality of life of PLHIV, with a focus on the psychological and social dimensions. This study, which is currently in its early stages, uses a cross-sectional and descriptive design. The research has two components: translation and validation of the WHOQOL-HIV BREF questionnaire into an Arabic dialect, and assessment of the quality of life of PLHIV in the Meknes region using this instrument. The study
will involve approximately 100 HIV-positive adults receiving antiretroviral therapy in health facilities in Meknes, selected through convenience sampling. Inclusion criteria include individuals aged 18 years or older, diagnosed with HIV, on antiretroviral therapy for at least three months, and willing to provide informed consent. The study hypothesizes that the psychological and social dimensions have the greatest impact on the quality of life of PLHIV.
Ethical approval will be sought from the Ethics Committee of the Faculty of Medicine, Pharmacy and Dentistry of Fes. The results are expected to provide valuable insights into the specific needs of PLHIV in the Meknes region and contribute to improving their quality of life. Feedback from this presentation will be used to refine the study and increase its relevance.

Keywords: AIDS/HIV, quality of life, Morocco, WHOQOLHIV-BREF

14. Comparative study of quality of life between breast cancer survivors and breast cancer patients undergoing radiotherapy in Morocco

Hanane Lemmih[1*], Badre Bakzaza[1], Meriem Essaidi[2], Saad Rachiq[1], and Sidi Mohammed Raoui[1,3]

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Breast cancer and its treatment have a profound impact on patients' quality of life. This comparative study assesses the quality of life of female breast cancer survivors in comparison to patients undergoing radiotherapy. The study includes 30 survivors and 30 patients receiving radiotherapy at the regional oncology center in Meknes, Morocco. Data were collected using the EORTC QLQ-C30 and EORTC QLQ-BR23 questionnaires and analyzed using SPSS 27. The findings suggest a significant improvement in the overall quality of life among survivors, particularly in physical, cognitive, and psychological functioning, as well as self-image and future outlook. However, no significant differences were observed in social interactions, sexuality, or leisure activities. In contrast, patients undergoing radiotherapy experienced higher levels of fatigue, nausea, vomiting, diarrhea, anorexia, and financial difficulties. These results highlight the importance of comprehensive care, including psychological support and tailored interventions, to enhance the well-being of both breast cancer survivors and patients undergoing radiotherapy.

Keywords: quality of life, survivors, radiotherapy, breast cancer, Morocco.

15. A Computational Study of Di-Substituted 1,2,3-Triazole Derivatives as Potential Mycobacterium Tuberculosis Drug Candidates. 3D-QSAR, Molecular Docking, Molecular Dynamics, and ADMETox

Yassine Koubi[1], Youness Moukhliss[1], Marwa Alaqarbeh[2], Aziz Mohammed Ajana[1], Hamid Maghat[1], Tahar Lakhlifi[1], and Mohammed Bouachrine [1,3,]

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3 EST Khenifra, Sultan Moulay Slimane University, Beni Mellal, Morocco

Tuberculosis (TB) is a transmissible infectious disease caused by Mycobacterium tuberculosis. Nearly 85% of new TB cases were diagnosed in sub-Saharan Africa and South Asia. *Para*-aminosalicylique acid (PAS), Isoniazid (INH), pyrazinamide (PZA), Cyclomerize, Ethionamide, Rifampicin, and Ethambutol have been used as chemotherapy for tuberculosis since the 1940s. But multidrug-resistant tuberculosis has revealed the need for new anti-TB agents. Recently, new anti-tuberculosis agents based on 1,2,3-triazole derivatives were proposed and investigated. The present work aimed to investigate the anti-tuberculosis activity of 24, 1,2,3-triazole derivatives synthesized by Costa et al. A three-dimensional quantitative structure-activity relationship (3D-QSAR) method was used to detect the potential interactions between the proposed 1,2,3-triazoles molecules and tuberculosis protein receptors. The 3D-QSAR models were built based on pMIC(-Log (MIC)) for 24 derivatives of 1,2,3-triazoles by dividing the proposed compounds into two groups; the first learning group to develop the mathematical model and the second test group to study the robustness and reliability of the created model. Molecular docking was conducted to investigate the bond type between protein-ligand complexes. A molecular dynamics simulation was performed for 100 ns to explore the stability of the protein-ligand complex and its dynamic behavior. ADMET investigated the study's pharmacokinetic properties of absorption, distribution, metabolism, and excretion Chemometric tools collect and analyze complex data from many biologically active molecules to build computer models that link chemical properties to biological activity.

INTERDISCIPLINARY AND SOCIAL SCIENCES AND HUMANITIES POSTERS

10:00 am – 12:00 pm

Zoom Link

Moderators: Melissa Haab and Chandler Findley

*Undergraduate Presentations **Graduate Presentations

16. Enhanced Electrochemical Performance in Cr (VI) Sensing using $Ti_3C_2T_x$/PANI Structure Enabled by PANI Interlayer

Simranjeet Singh and Praveen C. Ramamurthy

Interdisciplinary Centre For Water Research (ICWaR), India

This study reports the synthesis of a novel MXene/Polyaniline (MXene/PANI) composite via chemical oxidative polymerization of aniline monomers on Ti_3C_2Tx-MXene layers. Functional groups on the MXene surface (-O and -OH) act as nucleation sites, enabling uniform PANI deposition. The resulting composite exhibits a porous structure, enhancing electrolyte ion interaction and electrochemical performance. Comprehensive physicochemical characterization using FTIR, XRD, TGA, XPS, Raman spectroscopy, and SEM-EDS reveals the structural and compositional attributes of the composite. The MXene/PANI composite was integrated onto an electrode surface and successfully employed for detecting Cr(VI) in environmental samples, demonstrating its potential as a robust sensing material for heavy metal detection.

17. Mixed-anion Compounds as Cathode Materials for Na-Ion Batteries

Ghizlan En-Nabety[1], Safiya Es-Sehli[1], Rachid Essehli[2], and Mustapha Taleb[1]

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2 Electrification and Energy Infrastructures Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA

Sodium ion batteries (SIBs) are appealing due totheir widespread availability and low cost, inaddition to their electrochemical similaritieswith the well-proven lithium-ion batterytechnology. However, in order to be commercializedand to compete with the lithium counterpart, thecurrent electrode materials' low energy density, poorcycling stability, and slow sodium kinetics must beimproved. To increase the power and energydensity of SIBs, new cathode materials withhigh voltage, high capacity, and good electronic andionic conductivity must be developed.

18. Impact of Saline Irrigation Water on Durum Wheat (cv. Faraj) Growth on Sandy and Clay Soils

Khadija Manhou [1,2],Houria Dakak, Rachid Moussadek [2,3], Abdelmjid Zouahri [2], Ahmed Ghanimi [4], Ikram Rham [1],Yassine Mouniane[1], and Driss Hmouni [1]

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2 Research Unit on Environment and Conservation of Natural Resources, Regional Center of Rabat, National Institute of Agricultural Research, AV. Ennasr, Rabat 10101, Morocco

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In Morocco, saline irrigation has a significant impact on soil quality and crop yields. This study investigates the effects of salt stress on soil properties and the overall performance of the durum wheat variety “Faraj,” with the goal of optimizing production under saline conditions. A greenhouse experiment was conducted during the 2023–2024 season using a completely randomized design (CRD) to evaluate soil properties, plant growth, and yield. Five salinity levels (0.2, 4, 8, 12, and 16 dS m−1) were tested on two soil types: silty-clay (S1) and sandy (S2). The results revealed significant changes in soil characteristics, including increased pH, electrical conductivity, and higher concentrations of potassium, calcium, and magnesium in the soil. Grain yield decreased notably with increasing salinity, from 1.12 t ha−1 in freshwater to 0.12 t ha−1 at 16 dS m−1 in S1, and from 0.56 t ha−1 in freshwater to 0.12 t ha−1 at 16 dS m−1 in S2. Straw yield was less affected, with values of 1.24 and 1.16 t ha−1 for S1 and S2 at 12 dS m−1, respectively, decreasing to 0.80 and 0.55 t ha−1 at 16 dS m−1. The “Faraj” variety demonstrated good tolerance to salinity, maintaining a high grain yield up to 8 dS m−1 and straw yield up to 12 dS m−1, making it particularly well-suited for moderately saline environments.

Keywords: irrigation; salt stress; durum wheat; tolerance; yield; growth; biochemical and soil parameters

19. Evaluation of Dry Chemo-Mechanical Pretreatments of Chickpea Straw for Enhanced Reducing Sugar Release in Bioethanol Production

Mouna Aouine [1], Abdellatif Barakat[23], Soumya El Abed[1], and Saad Ibnsouda Koraichi[1]

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Dry chemo-mechanical pretreatment presents a promising eco-friendly strategy for converting lignocellulosic biomass into sugars and other valuable molecules. In this study, chickpea straw (CS) was initially impregnated with a sodium hydroxide (NaOH) solution and subsequently milled using a vibratory ball mill. A fractional factorial design was applied to optimize reducing sugar release, considering NaOH concentration, impregnation percentage, milling time, milling frequency, and ball diameter as process parameters. The experimental design results revealed that milling time, ball diameter, and the interaction between NaOH concentration and impregnation percentage had the most significant impact on sugar release. The optimal conditions for maximizing reducing sugar concentration (374.705 mg/g of chickpea straw) were 10% NaOH concentration, 50% impregnation, 60 minutes of milling, 30 Hz of frequency, and a ball diameter of 2.5 cm. Furthermore, an ethanol concentration of 17.81 g/L was obtained after simultaneous saccharification and fermentation of the pretreated CS under the defined optimized conditions.

Keywords: dry chemo-mechanical pretreatment, lignocellulose, reducing sugars, fractional factorial design, ethanol.

20. Antimicrobial Activity of Electrospun Polylactic Acid-Based Nanocomposite Films Enhanced with Silver Nanoparticles

Azzeddine Bechar[1], Khaoula Sebbar[1], Fatima Tizar[2,3], Moulay Sadiki[3], Mohammed Hassi[2], Ilyass Tabrika[4], Saad Ibnsouda Koraichi[1], and Soumya Elabed[1]

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2 Laboratory of Microbial Biotechnology and Plants Protection, Ibn Zohr University, Faculty of Science, Agadir, Morocco.

3 Laboratory of Geo-Bio-Environment and Innovation Engineering, Polydisciplinary Faculty of Taroudant, Ibn Zohr University, Agadir, Morocco.

4 Research and Development Laboratory, SAOAS Group, Tassila III, 80000 Agadir, Maroc

Fossil fuel-derived plastics used in food packaging represent a major environmental threat. In response to this issue, polylactic acid (PLA) is emerging as a promising eco-friendly alternative due to its biodegradability and compatibility. In this study, PLA-based films were developed using electrospinning, incorporating silver nanoparticles (AgNPs) synthesized using hydroethanolic extracts from two microalgae: *Spirulina* sp. and *Nanochloropsis* sp. These AgNPs were characterized using scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), Fourier-transform infrared spectroscopy (FTIR), and X-ray diffraction (XRD). The resulting nanocomposite films, containing 2%, 4%, and 6% (w/w PLA) of nanoparticles, were analyzed to determine their nanofiber diameter, chemical composition, and water solubility. The evaluation of their antimicrobial activity, conducted using the Kirby-Bauer test, demonstrated effective inhibition against *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*, with particularly notable activity against *P. aeruginosa* and *S. aureus*. These results highlight the potential of PLA-based films as a sustainable and functional alternative to conventional plastics in food packaging.

Keywords: Films; PLA; Silver nanoparticles; Antimicrobial activity; Microalgae.

21. Synthesis and Biological Evaluation of Pyrazole-Derived Heterocyclic Compounds from Cyanoester Epoxides

Houda Serrar[1,2], Mariam Barrahi[3], Asmae Qaliha[2], Said Boukhris[2], Amina Hassikou[2], Mohammed lachkar[1], and Abdelaziz Souizi[2]

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2 Laboratory of Organic Chemistry, Catalysis and Environment- Faculty of Science, Ibn Tofail University, Kenitra, Morocco;

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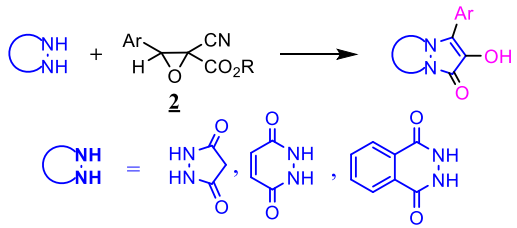
In this study, we synthesized four distinct heterocyclic families, comprising 3-(3-aryl-4-hydroxy-5-oxo-2,5-dihydro-1H-pyrazol-1-yl)-3-oxopropanenitriles, 6-hydroxy-7-aryl-pyrazolo[1,2-a]pyrazole-1,3,5(2H)-triones, 3-aryl-2-hydroxy-1H-pyrazolo[1,2-a]pyridazine-1,5,8-triones derived from cyanoester epoxides, and 3-aryl-2-hydroxy-1H-pyrazolo[1,2-b]phthalazine-1,5,10-trione. These compounds were synthesized via 2-epoxides (scheme 1) and characterized using IR spectral analyses, 1H NMR, and 13C NMR, alongside structural elucidation of the pyrazoles. Furthermore, we evaluated the biological properties of these heterocycles, focusing particularly on antimicrobial and antioxidant activities due to the importance of heterocyclic chemistry in these domains. Our synthesized compounds were tested against five bacterial strains and also evaluated for their antifungal activity against two Candida species. Additionally, the antioxidant potential of these novel heterocyclic products was assessed through various methods including FRAP, H_2O_2 scavenging assay, and phosphomolybdenum assay. This comprehensive evaluation underscores the potential applications of these synthesized heterocycles in pharmaceutical and therapeutic research.



Scheme 1: Synthesis reaction of pyrazole derivatives from epoxides.

Keywords: Heterocyclic compounds, pyrazole, pyrazolo[1,2-a]pyrazole, pyrazolo[1,2-a]pyridazine, pyrazolo[1,2-b]phthalazine, antioxidant, antimicrobial

22. Impact of Composting on Waste Management and the Quality of Vegetables: The Case of Red Beet in Morocco

Siham Belkacemi[1], Fathalah Elwahab[2], and Mohammed Oussine[1]

1 Laboratory of Natural Resources and Sustainable Development, Department of Biology, Faculty of sciences, Ibn Tofail University
2 Laboratory of Plant, Animal, and Agro- Industry Productions, Faculty of Sciences, Ibn Tofail University

Composting represents a key solution to address the environmental challenges associated with organic waste management in Morocco, while also offering opportunities to enhance agricultural production. This article examines current composting practices at the local and regional levels, highlighting their environmental impacts and their role in waste valorization. It also explores the effects of compost use on the quality of vegetable crops, using red beet as an example. Findings from previous research and case studies conducted in the Kenitra region demonstrate that adding compost to soils (Tirs and Sandy soils) significantly improves soil structure and fertility, thereby promoting higher yields and better vegetable quality. Specifically, red beet benefits from this practice in terms of nutritional content, size, texture, taste, and coloration, meeting the demands of both local and international markets.

Keywords: compost, management, red beet, quality

23. Near and Far Transfer of Working Memory Training in Autism Spectrum

Safae Sedjari and Mohammed El-Mir

Department of Psychology, Faculty of Letters and Human Sciences, Dhar El Mahraz, Sidi Mohamed Ben Abdellah University, Fez, Morocco

Autism spectrum disorder is a neurodevelopmental condition that affects multiple domains and spreads notably. It's characterized by impairments in social interactions and repetitive, restricted behaviors. A key explaining theory of this disorder considers that executive dysfunction underlies symptoms. Additionally, literature indicates these symptoms may be largely explained by working memory deficits. Working memory is conceptually and anatomically linked to executive control, and studies highlight its alteration in autism. Working memory training is a non-pharmacological treatment based on neuroplasticity, aiming to improve working memory through repetitive exercises. Research on this technique in autism is limited, often involving small samples. To address this gap, this study explored the effects of this training on working memory components, according to Baddeley and Hitch's (1974) model (near transfer), and its impact on reactive flexibility, planning, and autistic symptoms (far transfer).

One hundred seventy-nine individuals with autism were randomly divided into an experimental group receiving the «Cogmed» program or a control group with no intervention. Both groups were assessed before and after training using the same tasks: direct digit span task, Corsi block test, reverse digit span task, and modified digit span task to measure working memory components; Wisconsin Card Sorting Test to assess reactive flexibility; Tower of London Test for planning; and Social Communication Questionnaire to evaluate autistic symptoms. Statistical analysis revealed that in the experimental group, the intervention significantly improved the results of all tests and the questionnaire ($p < 0.01$, $\eta 2 > 0.14$), with a moderate effect observed for the modified digit span task ($p < 0.01$, $\eta 2 < 0.14$). No changes were found in the control group. A follow-up assessment showed improvements in the experimental group persisted two months after the training. These results demonstrate the effectiveness of working memory training for individuals with autism, reducing daily difficulties and enhancing social interactions.

Keywords: autism spectrum disorder, working memory, working memory training, reactive flexibility, planning, autistic symptoms

10:00am – 12:00 pm

Zoom Link

Moderators: Marti Herlong and Mark Davis

*Undergraduate Presentations **Graduate Presentations

24. *Pretreatment-Enhanced Microbial Electrolysis of Shrimp Waste: A Strategy for Simultaneous Energy and high-value product Recovery

Fatima Zehra

Faculté des Sciences et Techniques de Fès

Microbial electrolysis offers a sustainable pathway to energy production by harnessing the metabolic power of exoelectrogenic microorganisms to convert organic matter. However, the presence of recalcitrant compounds in organic waste often hinders exoelectrogenic activity and limits biohydrogen production. This study focuses on shrimp waste, a globally abundant byproduct of the shrimp processing industry (approximately 3.8 million tons annually), as a promising substrate for microbial electrolysis. Shrimp waste, particularly its exoskeleton, is a complex matrix rich in bioactive components, especially proteins (20–50%). To enhance energy conversion, this study employs a deproteinization strategy. Raw and deproteinized shrimp waste were compared as substrates in a single-chamber microbial electrolysis cell (MEC), operated at an applied voltage of -0.2 V vs. Saturated Calomel Electrode (SCE). Electrochemical analyses including chronoamperometry and cyclic voltammetry were performed using a BioLogic potentiostat, to quantify the current density generated and predict hydrogen production. Results showed that after 15 days, the deproteinized waste-fed MEC achieved a current density of 7.51 ± 1.24 A/m², significantly higher than the 3.49 ± 0.64 A/m² observed in acetate-fed MEC. The predicted hydrogen volume from the deproteinized waste (0.4 L) was over five times greater than that from acetate (0.07 L). Furthermore, the deproteinized waste demonstrated both higher current generation and a more sustained performance (45 days) compared to acetate (25 days). Conversely, raw waste exhibited poor performance (0.24 ± 0.04 A/m² and 0.01 L of H2) likely due to its limited biodegradability or the presence of some compounds that inhibit exoelectrogenic activity. These results confirm that the applied pretreatment effectively enhanced energy recovery from shrimp waste through microbial electrolysis, maximizing not only energy production but also allowing the recovery of protein.

25. *Enhancing Resistant Starch Content of Pea Starch Through Complexation with Gallic Acid and Alkyl Gallates

Sophia Marshall-Pelayo, Raju Ahmmed, Songnan Li, and Lingyan Kong

The University of Alabama, USA

Resistant starch (RS) is a type of starch that digests slowly, providing health benefits such as prolonged satiety, lowered blood glucose, and improved gut health. One way to increase the RS content of pea starch is through complexation with alkyl gallates and gallic acid. Research shows that alkyl gallates with longer chains can form inclusion complexes more effectively due to their larger and more stable lamellar structures. This study aims to enhance RS content in pea starch by complexing it with gallic acid and various alkyl gallates, including butyl, octyl, dodecyl, hexadecyl, and octadecyl gallates. Complexation was done using the dimethyl sulfoxide method, and the samples were analyzed using differential scanning calorimetry, x-ray diffraction, and in-vitro enzymatic digestion assays. Results showed that pea starch complexes yield less RS compared to high-amylose maize starch, likely due to pea starch's lower amylose content. Additionally, gallates with longer alkyl chains were more effective in complexation and resistant starch enhancement, consistent with previous studies. Enhancing RS content in pea starch could increase its use as a dietary fiber, offering potential benefits for glycemic control and lipid management.

26. *Renewable Energy

Manal El Loulidi

Ecole normale supérieur, Fes Morocco

The exploitation of renewable energy sources has seen considerable advancements in recent years. In this study, we focus on the conversion of solar energy into electrical energy (photovoltaics). Our aim is to achieve maximum efficiency from a PV module. To maximize the performance of solar energy systems, it is essential to track the Maximum Power Point (MPPT) of the input source. In this project, we will compare four MPPT control algorithms (P&O, PSO, ELM, and neural networks). This study outlines the simulation steps for these controls, presents their characteristics and performance, and was conducted in the MATLAB/SIMULINK environment.

Keywords: Keywords: artificial intelligence, intelligent systems, photovoltaic systems, energy optimization, renewable energy, MPPT, machine learning, performance enhancement, solar energy efficiency, predictive modeling, neural networks.

27. *Agronomic and Genetic Diversity of Moroccan Rice Varieties and Their Resistance to Blast Disease (*Pyricularia oryzae*)

Fathalah Elwahab[1,2], Mohamed Sedki[2], Siham Belkacemi[3], Soukaina Hamoumi[1], Mahmoud Oudghiri[1], Najiba Brhadda[1] and Rabea Ziri[1]

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The study on agronomic and genetic characteristics of rice has given us scope to select varieties with desirable characteristics to mitigate various constraints. Rice (*Oryza sativa*) is the staple food for half of the world's population. However, its production is hampered by a variety of biological constraints. The Blast disease (*Pyricularia oryzae*) is an important rice disease, and one of the most effective control methods is to use resistant varieties. Study areas in Morocco include the Gharb plains. For all methods, cultural practises like soil levelling seem to be important, but biological control is not widely adopted due to cost, efficacy, and climatic conditions. The bibliographic synthesis was carried out in this context with the main goals of contributing to a better understanding of rice cultivation in Morocco; to identify and characterize the structure of the rice blast pathogen (*Pyricularia oryzae*), which will allow us to characterize the effects of rice blast; and to research on the Gharb rice field, which resulted in resistant varieties, which will potentially allow producers to have resistant varieties to overcome the diseases. The introduction and development of new rice varieties with high agronomic and socioeconomic value; the selection of lines with high yield, good grain quality, and precocity that are adapted to Moroccan conditions; as well as the development of new lines from Moroccan rice, are among the specific goals.

Keywords: rice's agronomic and genetic, control methods*, pyricularia oryzae*, resistant varieties, morocco.

28. Novel 2-quinolone-triazole-α-aminophosphonate hybrids as potential yellow fever virus inhibitors

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Yellow fever virus (YFV) is an RNA virus belonging to the *Flaviviridae* family and is transmitted by mosquitoes. YFV is endemic to tropical and subtropical regions of sub-Saharan Africa and South America, where it continues to cause outbreaks. As there is no specific cure for the disease, vaccination remains the most effective preventive measure. However, YFV persists as a re-emerging threat, particularly in regions with low immunization coverage.

α-Aminophosphonates have garnered considerable attention in recent years due to their structural resemblance to α-amino acids, peptides and natural phosphates, as well as their notable biological activities. In this study, new hybrid compounds incorporating 4-methyl-2-quinolone, 1,2,3-triazole and α-aminophosphonate moieties within a single scaffold were synthesized and evaluated for activity against YFV. Four of the tested compounds exhibited significant anti-YFV activity, with IC_{50} values ranging from 9.91 to 10.42 µM. This compares favorably to the reference compound DMA, which had an IC_{50} of 16.30 µM. Meanwhile, the CC_{50} values for these compounds ranged from 19.97 to 31.03 µM, resulting in selectivity index (SI) values between 2.01 and 3.03. Molecular docking studies against the NS5 methyltransferase protein of YFV (PDB: 3EVA) revealed that these derivatives exhibit strong binding affinities and engage in multiple interactions, such as hydrogen bonding and hydrophobic contacts. These findings suggest their potential as inhibitors of this target protein.

Keywords: YFV, α- aminophosphonates, quinolone, triazole, molecular docking.

29. Statistical optimisation, genotoxicity & kinetic studies for improved Atrazine degradation by three novel isolates

Simranjeet Singh and Praveen C. Ramamurthy

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Atrazine, a widely used chlorinated herbicide in agriculture, has been found to potentially endanger human health and the environment. In this study, three new strains were identified-Bacillus mycoides strain (P2), Pseudomonas sp. strains (P3), and Pseudomonas furukawaii (P6). These strains exhibit effective reduction of Atrazine's toxic effects and rapid degradation of the herbicide. The degradation efficiency was found to follow the order P3 > P2 > P6. Over a thirteen-day experiment, all strains demonstrated Atrazine utilization, with a half-life period ranging from 65.53 to 102.32 days by using Pseudo first-order kinetics. Response surface methodology was employed to optimize the biodegradation parameters, including Atrazine dosage, pH, and temperature, for all three strains. The investigation revealed that the optimum conditions for Atrazine degradation by all strains were pH 7.4, temperature 32 ±2 °C, and concentration 100 mg/L. Gas chromatography-mass spectrometry results identified the major degradation products of Atrazine, including Deisopropylatrazine (DIA) at RT 6.46, Deethylatrazine (DEA) at RT 12.22, and Cyanuric acid (CNA) at RT 14.22. All three isolated strains exhibited hydrolysis of α-naphthyl acetate, suggesting the presence of intracellular esterase enzymes. Genotoxicity studies on the degradation products depicted toxicity in the order Atrazine>DEA>DIA>CNA. These Atrazine-biodegrading isolates show promise as effective remediators for Atrazine-contaminated agricultural soils and crop fields, as well as for environmental cleaning processes involving other pesticides.

30. RbCu(HCO2)2Cl: Synthesis, crystal structure, thermal properties and magnetism of a novel hybrid organic-inorganic Cu formate-based framework

Asmae Ben Abdelhadi[1], Rachid Ouarsal[1], Morgane Poupon[2], Michal Dusek[2], Marco Antonio de la Torre[3], Brahim El Bali[4], Mohammed Lachkar[1], and Abderrazzak Douhal[5]

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Slow diffusion method was used to synthesize a novel hybrid organic-inorganic Cu formate-based framework, $RbCu(HCO_2)_2Cl$ **(1)**, with interesting magnetic properties. The single crystal X-ray diffraction data reveals that **1** crystallizes in a monoclinic system with space group $P2_1/n$, a = 8.242 (2)Å, b = 7.979 (2)Å, c = 9.723 (2)Å, β = 95.40 (3)° and V = 636.5 (3)$Å^3$ at 300.1 K. The structure consists of Rb^+ cation as a counter ion and a dinuclear copper-copper dimer formed by a paddle-wheel (PW) arrangement of formate anions in the syn-syn configuration. Each Cu(II) atom has a square pyramidal environment with a Cu ···Cu intramolecular distance of 2.7070 (7) Å. ATR-FTIR spectrum confirms the existence of the formate anion ($HCOO^-$). The thermal behavior of **1** was studied in the temperature range of 315 to 560 K and it revealed that the compound started to decompose at 350 K with a total mass loss of 60%. The magnetic properties indicate that **1** exhibit rich magnetic properties.

Keywords: Cu formate-based framework· Dinuclear Cu(II) paddle-wheel· Crystal structure· Vibrational studies· Thermal decomposition· Magnetic measurements.

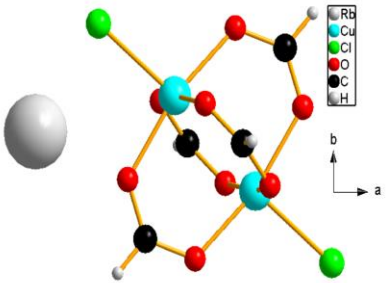

Figure 1. The molecular structure of $RbCu(HCO_2)_2Cl$.

31. Synthesis, Structural Analysis, Corrosion Inhibition Efficiency, of 2-methyl-[1,2,4] triazolo[1,5-a] pyrimidin-6-ol: Insights from Experimental and Computational Studies

H. Elmrayej, J. Lazrak, G. En-Nabety, H. Zejli, Z. Rais, and M. Taleb

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The synthesis of 2-methyl-[1,2,4] triazolo[1,5-a]pyrimidin-6-ol (MTP) was pursued, and its structure was determined through a sequence of spectral analyses, including 1H-NMR, 13C-NMR, IR, and HRMS. The impact of MTP on the corrosion of mild steel (MS) in a 1 M HCl solution was evaluated using various methods such as weight loss, potentiodynamic polarization (PDP), electrochemical impedance spectroscopy (EIS), and scanning electron microscope (SEM) analysis. The study revealed that the effectiveness of MTP as an inhibitor increased with the concentration but decreased with temperature. The PDP analysis suggested that MTP acted as a mixed-type inhibitor, whereas the EIS data showed that it created a protective coating at the interface between the steel and the solution. Langmuir's adsorption isotherm governed the adsorption behavior of MTP on the steel surface. Furthermore, density functional theory (DFT) and Monte Carlo (MC) simulation studies provided additional confirmation of the substantial adsorption capacity of the inhibitor molecule on the MS surface.

Keywords: adsorption energy; biological Studies; DFT; MS corrosion; MC simulation; triazolopyrimidine.

32. Evaluation of a spray-dried bacteriocin produced by Enterococcus durans F21 as a bio-preservative in various food matrices

Ghita Benkirane[1,2], Laila Manni[1], Emilie Dumas[2], Adem Gharsallaoui[2], and Samir Ananou[1]

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Currently, the application of chemical preservatives and physical treatments has become crucial in preventing the proliferation of harmful bacteria and spoilage in food, as well as enhancing their shelf life and safety. However, concerns among consumers regarding the potential toxicity of certain chemical additives, coupled with the negative impact these methods may have on the sensory characteristics of food, have led to a growing interest in natural alternatives. Consequently, this has led to increased interest in the use of Lactic Acid Bacteria (LAB) and their bacteriocins. These naturally occurring antimicrobial peptides have recently gained significant attention, not only for their potential as therapeutic agents but also for their promising role as natural preservatives in food.

Enterococcus durans F21, a bacteriocin-producing LAB strain isolated from Moroccan fermented milk "Lben," demonstrated impressive properties, including the production of a heat-stable bacteriocin that is also resistant to acidic conditions. Moreover, this bacteriocin exhibited strong activity against a range of potential foodborne pathogens and spoilage bacteria, such as *Listeria monocytogenes*, *Listeria innocua*, *Enterococcus faecalis*, *Brochothrix thermosphacta*, and *Mycobacterium smegmatis*.

A bio-preservative powder containing this bacteriocin was prepared through spray drying, with maltodextrins used as carriers for the drying process. The resulting powder was tested for its bio-preservative properties in various food products, including whole and skimmed UHT milk, Moroccan fresh cheese (Jben), and ground meat. The results demonstrated that the bio-preservative powder successfully enhanced the safety and extended the shelf life of these food matrices, highlighting its potential as a valuable natural preservative for a wide range of food applications.

Keywords: Bacteriocin, Bio-preservation, *Enterococcus durans*, Ground beef, Fresh cheese, Milk.

33. Biological Control of Penicillium Digitatum and Penicillium Italicum on Postharvest citrus fruits

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Green mold (Penicillium digitatum) and blue mold (Penicillium italicum) are two of the most economically significant post-harvest diseases affecting citrus fruit worldwide.. The widespread economic losses in citriculture caused by these phytopathogens are minimized with the use of synthetic fungicides such as imazalil, thiabendazole, pyrimethanil, and fludioxonil, which are mainly employed as control agents and may have harmful effects on human health and environment. So far, many non-chemical post-harvest treatments have been investigated for the control of these pathogens.

Biological control of Penicillium in citrus has shown promising results using various antagonistic microorganisms. Bacillus pumilus demonstrated significant control of P. digitatum on oranges and lemons, comparable to chemical fungicides. Yeasts like Debaryomyces hansenii and bacteria such as Pseudomonas cepacia exhibited effective antagonism against P. digitatum and P. italicum. Pseudomonas fluorescens significantly inhibited P. digitatum growth on oranges, both in vitro and in vivo. The fungus Trichoderma viride increased orange resistance to P. digitatum when applied preventatively. These studies demonstrate that various microorganisms can effectively control Penicillium in citrus fruits, offering potential alternatives to chemical fungicides. The efficacy of biological control agents depends on factors such as concentration, timing of application, and specific antagonist-pathogen interactions.

Keywords: citrus, Penicillium digitatum, Penicillium italicum, post-harvest disease, biological control.

BUSINESS AND ECONOMICS ORAL PRESENTATIONS

1:00 pm – 3:00 pm

Zoom Link

Moderators: Chris Theriot

*Undergraduate Presentations **Graduate Presentations

34. *Individual capacity to change: The mediating role of psychological capital in individual changing process to sustain performance

S. Allah Allouani and W. Barkani

University Sidi Mohamed Ben Abdellah, Morocco

In a time of constant evolution and heightened competition, organizations need to foster sustainability by improving the change capacity of their employees. In a VUCA (vulnerable, uncertain, complex, and ambiguous) environment, the ability to adapt to change at both the organizational and individual levels is especially important. Developing one's capacity for change is a complex and challenging process that is best tackled on an individual basis. This article seeks to elucidate the factors that influence an individual's capacity for change, shaping their attitudes and supporting their behaviors in relation to change. We conducted a systematic review using journals from SCOPUS and Web of Science, with a focus on organizational change capacity (OCC) and organizational behavior. We also utilized Google Scholar and Research Rabbit to support our analyses. We analyzed the 86 gathered articles to create a conceptual map that elucidates the antecedents of individual change capacity, rooted in the psychological resources of the individual. Drawing from the theory of dynamic capabilities, we explore how psychological capital, which includes self-efficacy, optimism, hope, and resilience, interacts with individual adaptability, engagement, and readiness to change, ultimately contributing to sustained long-term viability and performance. This study explores the cyclical and dynamic aspects of individual change processes, focusing on how the alignment of PsyCap resources interacts with individual attitudes toward change, ultimately contributing to sustained performance.

Key concepts: psychological capital, dynamic capabilities, individual change capacity, systematic review, sustainable performance

35. *Little Tots Academy

Yousef Elgaabry

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In today's rapidly evolving educational landscape, digital platforms are reshaping the way young minds engage with knowledge. Little Tots Academy introduces an innovative e-learning solution tailored for children aged 3 to 12, combining engaging content with interactive tools to ignite curiosity and foster lifelong learning. Offering a comprehensive range of courses, from language acquisition to psychology, the platform ensures a holistic approach to intellectual growth. What sets Little Tots Academy apart is its commitment to a safe and inclusive online environment. The platform integrates robust parental controls, real-time progress tracking, and guidance from certified educators, providing a secure and enriching learning experience. This research delves into the development and impact of Little Tots Academy, highlighting its potential to redefine early childhood education in the digital age.

36. **Why Emiraty People Tend to Buy Luxury Goods, Is it Because They Think Sustainability? Or Just Because They Can Afford it

Ahmad Abdulla and Shaikha Al Hadidi

Ajman University, UAE

Wealthy people often buy expensive items for several interconnected reasons beyond mere utility. First, luxury purchases offer a way to express identity and status, acting as symbols of success and social standing. High-end items like designer clothing, luxury cars, or rare art signal affluence and taste, which can reinforce an individual's self-image and prestige in society. Additionally, wealthy individuals may seek the quality, exclusivity, and craftsmanship that expensive goods often promise, finding pleasure in their rarity or the skill behind them. Expensive items can also serve as investments; luxury goods, art, and real estate may appreciate over time, providing both status and financial returns. Lastly, psychological factors such as the pursuit of novelty, the desire for unique experiences, or the social pressures within elite circles can drive these spending patterns. In sum, affluent individuals often view luxury purchases as multifaceted assets that contribute to identity, enjoyment, social status, and financial growth.

Many wealthy individuals are increasingly considering sustainability in their purchasing decisions, although motivations and practices vary. As environmental awareness has grown, so has the appeal of sustainable luxury goods, which combine exclusivity with ethical production standards. For some affluent consumers, sustainable purchases align with a sense of responsibility, as their influence and resources can enable them to lead by example in promoting eco-consciousness. Luxury brands, in response, are shifting toward eco-friendly materials, transparent supply chains, and responsible sourcing, making it easier for wealthy consumers to buy sustainably.

However, sustainability among the wealthy can sometimes be more symbolic than impactful—like buying a high-end electric car or organic products without making broader lifestyle changes. Still, there's a segment of affluent buyers genuinely committed to reducing environmental impact, who opt for high-quality, timeless items over fast fashion, invest in renewable energy, or even fund environmental initiatives. So, while sustainability does play a role for some wealthy consumers, the depth of commitment can range widely from symbolic gestures to profound lifestyle shifts and advocacy.

37. **Transitioning from Inequalities: The Role of agricultural entrepreneurship in rural development

Najoua Khayati and Abdelali Lahrech

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The promotion of entrepreneurship is a strategic lever for territorial development. In Morocco, the agricultural sector is the most significant contributor to development in rural areas. However, disparities between rural and urban areas make it problematic to conduct entrepreneurial activities in rural settings. Accordingly, the Ministry of Agriculture has implemented the youth entrepreneurship program. It aims to promote the contribution of young entrepreneurs to agricultural development and to revitalize the rural local fabric.

The objective of our research is to analyze the impact of agricultural entrepreneurship on the development of rural territories in Morocco, particularly in the Fez-Meknès region. The originality of our study lies in an integrated analysis approach, which takes into account both economic and social aspects. Through our work, we aim to provide practical recommendations to the challenges faced by entrepreneurs. We also intend to emphasize the role that the entrepreneurial ecosystem plays in socio-economic development.

For the empirical development of our research, we used a mixed-methods approach. We conducted semi-structured interviews with actors of the agricultural entrepreneurial ecosystem. Afterwards, we administered questionnaires to entrepreneurs who have benefited from the program.

Our preliminary results demonstrate that the implementation of agricultural projects contributes to improving the living conditions of rural populations. Furthermore, agricultural entrepreneurship plays a major role in revitalizing territories, and strengthening their resilience. However, it faces numerous obstacles, particularly in terms of poor education, access to technology, funding and infrastructures.

Our work contributes to its field of research by providing empirical evidence on the pivotal role agricultural entrepreneurship plays in developing rural territories. Our preliminary findings highlight how factors such as a growth-driven perspective, coherent policies, and effective resource allocation can contribute to global development outcomes. In addition, they will be of great use to inform public policy and decision-making.

Keywords: agricultural, entrepreneurship, development, rural, territories.

38. **Beyond traditional governance: How CEO traits and cognitive biases shape decision-making and firm performance

Salma Naselhaj and Youssef Fahmi

LAREMEF Lab. ENCG - Sidi Mohamed Ben Abdellah University, Morocco

Corporate governance (CG) has traditionally focused on compliance and shareholder value, but recent research highlights the influence of cognitive and behavioral factors on governance effectiveness. CEO characteristics and cognitive biases play a crucial role in shaping strategic decision-making and firm performance. This paper conducts a systematic literature review to explore (1) how CEO traits—such as demographics, personality, and experience—affect corporate decision-making, (2) how cognitive biases, including overconfidence and anchoring, influence governance outcomes, and (3) the interplay between CEO cognitive-behavioral biases and firm performance.
Following the PRISMA model, we systematically screened and analyzed 23 journal articles and conference papers published between 2021 and 2024 from an initial pool of 300 studies. Articles were selected based on predefined inclusion criteria, focusing on English-language publications that examine CEO characteristics, cognitive biases, and corporate performance. Our findings reveal that CEO cognitive profiles significantly shape governance strategies and organizational outcomes, emphasizing the need to integrate psychological insights into corporate governance frameworks. This review contributes to the literature by synthesizing recent research and identifying avenues for future empirical studies on CEO cognition and decision-making in governance.

Keywords: corporate governance, cognitive biases, CEO characteristics, decision-making, organizational performance, systematic literature review.

39. **Psychic Distance in the Uppsala Model: Determinant of Moroccan Insurers Internationalization

Bertat Fatimazahra and Alaoui Ismaili Abderrahman

Sidi Mohamed Ben Abdellah University, Higher School of Technology of Fes, Morocco

Regional integration, reduced transport costs, and lowered customs barriers have transformed the industrial and competitive landscape. The global economy and technology are increasingly interconnected, reducing the need for time and space. In this context, the internationalization of companies is essential, as many seek to expand beyond national borders to capture growth opportunities and access larger markets. This dynamic is driven by globalization, technological advancements, competitiveness, and trade liberalization. In Morocco, insurance companies are internationalizing to access foreign markets and increase profitability. Several have already expanded to East and West Africa, operating in an ecosystem that demands international openness. This study focuses on the internationalization process of Moroccan insurers, using Wafa Assurance in Africa as a unique case study. The research emphasizes the role of psychic distance as a key factor in internationalization decisions. The main question guiding this research is: What influence does psychic distance have on Moroccan insurers' internationalization decisions in Africa? Through a qualitative approach, this study uses case study methodology, collecting data from key stakeholders involved in Wafa Assurance's internationalization. The analysis, conducted using thematic content analysis and NVivo software, reveals that reduced psychic distance significantly influences the company's expansion into Sub-Saharan Africa. The findings show that the proximity in language, culture, and geography played a major role in the company's successful market entry and smoother adaptation to local conditions. This research contributes to the understanding of psychic distance in international business theory, particularly in emerging markets like Africa. It highlights the importance of cultural and geographical proximity in internationalization strategies, offering practical insights for Moroccan insurers. By addressing psychic distance, companies can enhance their market positioning and adapt more effectively to diverse cultural contexts.

Keywords: Regional Integration, Psychic Distance, Uppsala Model, Internationalization, Moroccan Insurers, Africa.

40. **Value Creation in the Age of Artificial Intelligence (AI): A Systematic Literature Review

Oumayma Khouja[1] and El Hassani Youssef[2]

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Since Michael Porter's seminal article Competitive Advantage: Creating and Sustaining Superior Performance published in 1985, a vast literature dedicated to value creation has emerged. This strategy involves companies creating value for their customers while maintaining a sustainable competitive advantage. On the other hand, Artificial Intelligence has become a global phenomenon in recent years, impacting all sectors, including marketing, where it plays a crucial role. This has sparked the curiosity of researchers and investors, leading to an exponential growth in publications and massive investments.

The aim of this paper is to explore the relationship between value creation and Artificial Intelligence, and to examine how the latter can influence value creation within the company. To achieve this goal, the PRISMA method was employed for the rigorous selection of relevant articles. A thorough literature review was conducted, drawing on research to define the dimensions of value creation and Artificial Intelligence.

Keywords: value creation, artificial intelligence; marketing

41. **Green Marketing, Brand Loyalty, and eWOM: Evaluating Corporate Social Responsibility Mediating Role within the Theory of Planned Behavior

Ahmed Meliani

University Sidi Mohamed Ben Abdellah, Fès, Morocco

In an age when environmental consciousness is increasingly affecting customer behavior, green marketing has become an essential strategy for firms aiming to enhance electronic word-of-mouth (eWOM) along with brand loyalty. This study examines how green marketing affects North African consumer outcomes, with an emphasis on Corporate Social Responsibility (CSR) as a mediator, and consumer environmental values and attitudes toward green products as moderators. The study investigates these links using Structural Equation Modeling (SEM), drawing on a survey of 278 consumers from North African countries. The findings show that green marketing significantly increases both brand loyalty and eWOM, with CSR serving as a key mediator. However, high levels of consumer environmental values can dampen these positive effects, emphasizing the importance of authenticity in green marketing initiatives. These findings highlight the importance for emerging market companies and policymakers to integrate genuine CSR programs with green marketing strategies in order to attract environmentally conscious customers while avoiding perceptions of greenwashing. This study contributes to the field by offering empirical evidence from an underexplored situation and providing useful guidance for promoting sustainable consumer behavior and effective green marketing practices.

42. Social Protection as a Catalyst for Sustainable and Inclusive Growth: The Case of Morocco

Youssef Boujellaba and Tarik Jellouli

Sidi Mohammed Ben Abdellah University, Fès, Morocco

Social protection plays a pivotal role in fostering sustainable and inclusive growth by reducing poverty, enhancing economic stability, and ensuring equitable access to essential services. This study examines the Moroccan social protection system as a model for achieving sustainable development goals, analyzing its policies, challenges, and impact on economic and social inclusion. Through a multidisciplinary approach, this research explores how Morocco's strategic reforms—such as universal health coverage, social safety nets, and pension system expansion—contribute to economic resilience, job creation, and human capital development.

The analysis integrates qualitative and quantitative data from government reports, academic studies, and international organizations to assess the effectiveness of Morocco's social protection programs. Special attention is given to their role in addressing income inequality, gender disparities, and the integration of vulnerable populations into the formal economy. The study further evaluates policy coherence and institutional coordination in implementing these initiatives, highlighting best practices and areas for improvement.

Findings suggest that Morocco's social protection strategies have made significant strides in promoting inclusive growth but require further refinement in targeting, financing, and governance mechanisms to maximize their impact. The research offers policy recommendations to enhance sustainability, efficiency, and inclusivity in Morocco's social protection framework, providing insights for other developing nations pursuing similar objectives.
This study contributes to the broader discourse on social protection as a driver of sustainable development, emphasizing its role in achieving economic equity and resilience. It aligns with the themes of interdisciplinary research, policy innovation, and sustainable growth, making it a valuable addition to academic discussions at the University of West Alabama's Academic Research Conference.

EDUCATION AND SOCIAL SCIENCES AND HUMANITIES ORAL PRESENTATIONS

1:00 pm – 3:00 pm

Zoom Link

Moderators: Kendrick Prewitt and Melissa Haab

*Undergraduate Presentations **Graduate Presentations

43. **Cyberbullying Among Students of BA English Studies: the Moroccan Context as a Case Study

Mehdi Belghmi[1] and Elhassane El Hilali[2]

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Language and linguistic forms of communication have always impacted individuals in many ways. The proliferation of social media has further amplified all forms of communication and paved the way for some new forms that were not mainstream before. These new forms of communication are self-centred and personal, often empowering a sense of nonchalance. Cyberbullying, or bullying via technology-mediated tools and platforms, is one of the communication forms by which an individual or a group of people sends unsolicited messages that contain invective and violent text to someone else to scare them or psychologically manipulate them. With over 96% of teens having access to the internet, cyberbullying has become a growing concern, often leading to anxiety, depression, and, in extreme cases, suicide. Henceforth, the research explores students' experiences with cyberbullying, the most used digital platforms for harassment, and the relationship between victims and perpetrators. The study employs a quantitative methodology, using a structured questionnaire distributed over 1345 university students. Findings indicate that more than 50% of respondents have experienced cyberbullying via social media platforms such as X, Instagram, Snapchat, and WhatsApp. Furthermore, the study investigates prevention strategies, emphasizing the role of parents, educators, and policymakers in addressing cyberbullying. This research stresses the urgency of addressing cyberbullying and its long-term effects on students' mental well-being. Finally, the research calls for collaborative efforts from institutions, families, and digital platforms to mitigate online harassment and create a safer cyberspace for young individuals, as it sets the tone by being the first of its kind to study this type of interaction in the Moroccan context and calls for similar studies in different contexts and with different societal segments so the data and findings are representative for a wider spectrum of populations.

Keywords: Cyberbullying, students' experiences, technology-mediated tools, Moroccan schools, students' perceptions

44. **Virtual Classroom Management in Life and Earth Sciences: Practices and Challenges of Secondary School Teachers in the Marrakech-Safi Region

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2 Interdisciplinary Research Laboratory in Didactics, Education, and Training (LIRDEF), Higher Normal School, Cadi Ayyad University, Marrakech, Morocco.

The rise of distance learning has profoundly transformed pedagogical practices, particularly in the teaching of Life and Earth Sciences (SVT). This study aims to analyze the virtual classroom management practices of secondary school SVT teachers and identify the main challenges they face.

A survey was conducted among 144 teachers from the Marrakech-Safi region who used the official Microsoft Teams platform for synchronous distance learning. Data analysis highlights several difficulties: issues related to content structuring and clarity of learning objectives within sessions. Furthermore, limited integration of virtual experiments and interactive tools was observed, restricting hands-on activities and the illustration of scientific concepts in SVT. Teachers also reported difficulties in time management, a lack of student interaction and participation, and lower motivation levels compared to face-to-face instruction. Additionally, the workload is perceived as heavier, requiring adaptations in pedagogical approaches and better institutional support.
These findings emphasize the need to strengthen teacher training in lesson design, the use of virtual experiments, and interactive strategies that promote active student engagement. This study opens perspectives for the improvement of virtual classroom management in SVT and the optimization of pedagogical practices adapted to distance education.

Keywords: Virtual classroom, SVT distance learning, virtual experiments, teacher training.

45. **Optimizing Photocatalysis for Sustainable Pollution Remediation

Aiza Maqbool

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Photocatalysis is an innovative technology with significant potential for addressing industrial pollution in aqueous solutions, on surfaces, and in gaseous emissions. The efficiency of photodegradation is strongly influenced by light intensity and exposure duration, highlighting the need to optimize these parameters. Additionally, temperature and pH play a critical role in determining pollutant speciation, surface interactions, and reaction kinetics, making their consideration essential for process optimization.

As an eco-friendly and adaptable method for treating wastewater, photocatalytic degradation effectively removes organic contaminants, making it a valuable tool in environmental remediation. Achieving selectivity in photocatalytic degradation requires a multidisciplinary approach encompassing catalyst design, reaction optimization, and an in-depth understanding of chemical processes. Researchers are actively enhancing these components to develop efficient and sustainable solutions for pollution control and environmental restoration.

46. **The Impact of Dialogic Approach on ESP University Students' Speaking Anxiety and Emotional Wellbeing

Insaf Khoudri

Moulay Ismail University, ENS Meknes, Morocco

This study aimed to examine the effectiveness of the dialogic teaching approach in reducing speaking anxiety and enhancing the emotional well-being of ESP undergraduate learners in English classes. To achieve this, two groups of students from the Department of Management Technique at the High School of Technology in Meknes, Morocco were sampled. Data were collected using a quasi-experimental research design that combined non-equivalent group design with pretest and posttest measures. SPSS was utilized for data analysis, employing two tests: a t-test for within-group comparisons before and after the intervention, and an independent sample test for between-group comparisons pre-and post-intervention. The results indicated that the dialogic approach enhanced ESP learners' speaking abilities, reduced their speaking anxiety, and improved their emotional well-being compared to the control group, which did not receive any intervention and continued with traditional lectures. The study implies that there is a need for interactive teaching methods and support for public speaking skills.

Keywords: dialogic approach, emotional well-being, ESP, speaking anxiety, undergraduate learners

47. **Between Tradition and Modernity: Exploring Moroccan Women's Attitudes Towards Abortion

Ahmed Lehfid

English Department, Sidi Mohamed Ben Abdellah University, Morocco

Abortion remains a debatable issue in Morocco, where traditional views clash with modern perspectives. This study aims to explore the factors that influence the decision of women – both single and married – to seek abortion. It also aims to examine public attitudes towards this practice. That is to say, the central research question focuses on whether the Moroccan society is evolving towards a more liberal modern stance on the issue or adhering to traditional values that are deeply rooted in religious and cultural norms. To address this issue, the study adopts a two-pronged approach. First, a content analysis is conducted on the perspectives of prominent figures namely religious scholars, feminist activists and policymakers who either support or oppose abortion. This analysis will help frame the issue within the cultural, legal and religious dimensions that shape public discourse surrounding abortion in Morocco. Following this, a fieldwork is conducted through distributing questionnaires to a diverse group of women to capture their personal attitudes towards abortion. Preliminary results from the content analysis demonstrate a diverged public discourse. To illustrate, religious scholars oppose abortion whereas feminist activists and some policymakers advocate for reproductive rights. The responses from the questionnaire are expected to reflect a similar division as younger women are more likely to support access to abortion services while older women hold more traditional views. The findings of this study will offer valuable information about the direction of the Moroccan society's stance on abortion as they will provide a foundation for further discussion on reproductive rights in the country.

Keywords: abortion, reproductive rights, Moroccan society, public attitudes, traditional opinions, modern perspectives

48. **Exploring ELT Practitioners' Attitudes towards the Digitization of EFL Practices: What Impact on Soft Skills?

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Faculty of Letters and Human Sciences, Dhar El Mehraz, Fez, Morocco

In response to the global shift toward digitalizing teaching practices, EFL programs have increasingly focused on integrating soft skills to promote effective instruction and enhance learning quality. In Morocco, the recent extension of English instruction to the 7th and 8th grades in secondary schools presents a new challenge for ELT practitioners: addressing learners' diverse interests, learning styles, and high expectations. Insights gathered from pedagogical meetings, training sessions, and workshops highlight teachers' growing use of ICT tools to foster essential social skills—effective communication, collaboration, critical thinking, and leadership—collectively known as the "4 Cs," which are critical for 21st-century learners. This study employs semi-structured interviews with 30 teachers from Taza Directorate in the Fez- Meknes region to qualitatively investigate their perceptions and attitudes toward the role of digitalized teaching practices in developing these soft skills. It also examines practitioners' understanding of the 4 Cs and their reflections on how these skills influence learners' performance and contribute to teachers' professional growth. The findings offer practical insights and pedagogical recommendations to help ELT practitioners effectively incorporate digital tools as supplementary resources.

Keywords: Digitalization in ELT, soft skills, effective teaching, quality learning, continuous training.

49. Arab Digital Medial and National Security

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This study aims to investigate the role of digital media in maintaining national security for states, based on the perspective provided by the Copenhagen School of Security Studies, which considers national security as a societal rather than a purely technical-operational concept. Researchers within the school shifted the focus of security from being state-centered to a social matter, viewing other public and private institutions as partners in building national security. This approach has led to a significant shift in the conceptual framework of the term, which was previously referred to in Anglo-saxon countries as 'National Security' and in Francophone countries as 'La sécurité intérieure'. However, following the new perspective introduced by the Copenhagen School, the terminology evolved into 'Homeland Security'. Along with this terminological development, and in addition to the perspective presented by the Copenhagen School, the UN report on human development in (1994) redefined the concept by presenting it as the prevention of persistent threats, such as famine, disease, and oppression, as well as anything that could disrupt people's daily lives in seven crucial areas: food security, health security, environmental security, personal security, community security, and political security. Aligning with the development of the concept of national security, this study also relies on "the spinning intelligence theory" as a theoretical framework. This theory supports the critical discourse analysis approach utilized in this work to analyze and study how different Arab digital media addresses and represent the societal phenomena related to national security, such as migration especially the Sub-Saharan migrants moving to Morocco, The phenomenon of declining bread supply in Egypt as a primary source of nutrition, and the media's interaction with the film 'The Life of Goats in Saudi Arabia' as a significant event impacting the relationship between Saudi citizens and Indian immigrants.

Key words: Copenhagen School of Security, National Security, Homeland Security, Arab Digital Media, Spinning Intelligence Theory.

50. Towards ergative construction in Kartvelian languages

Nato Akhalaia

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The ergative construction is considered to be the oldest and most significant construction of transitive verbs in the Iberian-Caucasian languages. From the second half of the 19th century to the first half of the 20th century, many scholars tried to clarify the essence of its peculiarity; Most of them followed the theory of passiveness of transitive verbs, and some of them followed the theory of activeness, although they also tried to develop intermediate viewpoints. By the end of the 20th century, the theory of activity became popular.
Arnold Chikobava, who devoted several fundamental studies to the mentioned issue, considered the stem of the transitive verb of the ergative construction in the Kartvelian languages as neutral, indefinite (in the first and second person) and indifferent to the gender.
Analyzing the finite amount of kartvelian languages material, it was revealed that ergativity is determined by the active semantics of the subject and not by the existence of a formal or nominal direct object in the actant construction of the verb. A subject with active semantics could only coordinate with an occurrence, and this coordination was always expressed by an ergative construction, which is actually completely preserved in Laz (except for a few entries expressing natural phenomenon), and partially in Megrelian. Cf:

Laz	**Megrelian**
ǯoġori-k lal-up-s dog-ERG bark-ATM-PRS.S3.SG “The dog barks“	ǯoġor-i lal-un-s dog-NOM bark-ATM-PRS.S3.SG “The dog barks”
ǯoġori-k lal-u dog-ERG bark-AOR.S3.SG “The dog barked“	ǯoġori-k lal-u dog-ERG bark-AOR.S3.SG “The dog barked“
ǯoġori-k lalu-doren dog-ERG barking -AUX “The dog has barked“	ǯoġori-s u-lal-u-u-n dog-DAT OV-bark-ATM-ST-S3 “The dog has barked“

In the paper, the author discusses in detail such constructions in Megrelian-Laz, and based on historical-comparative and typological research methods, presents the validity of the mentioned standpoint.

EDUCATION PROFESSIONAL ORAL PRESENTATIONS

1:00 pm – 3:00 pm

Zoom Link

Moderators: Gena Robbins and Chandler Findley

51. Students' Perspectives on E-Learning as an Instructional Method during the Covid-19 Pandemic at Moroccan Universities

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The COVID-19 epidemic has necessitated the incorporation of e-learning in all educational institutions, including schools, colleges, and universities globally. The offline teaching process has been significantly hindered by this unforeseen occurrence. E-learning is an effective educational instrument that enables students to realize their maximum potential. This study seeks to examine the E-learning experience of sixth-semester English department students at Moulay Ismail University in Meknes, Morocco, along with the problems they encountered. Primary data was acquired from semester 6 students of the English department at Moulay Ismail University in Meknes, Morocco, via a Google Forms survey questionnaire to ascertain their impressions of e-learning during the COVID-19 epidemic. The results indicate that the majority of students are discontented with distant learning and perceive it as detrimental to their academic achievement. The results indicate that significant reform is necessary for the Moroccan educational system.

Keywords: COVID-19, distance education, in-person learning, online learning, students' perceptions

52. A theoretical strategy to enhance the functionality of hole transport materials for effective perovskite solar cells based on thiophene and TPA derivatives

A. Staoui, A. Idrissi, Z. El Fakir, Y. Baddi, and S. Bouzakraoui

Laboratory of Advanced Materials and Process Engineering, Faculty of Sciences, Ibn Tofaïl University, Campus Universitaire, Kénitra, Maroc

Perovskite solar cells (PSCs) represent one of the most promising advancements in renewable energy research, with their power conversion efficiency (PCE) soaring from below 5% to a certified value exceeding 26.1% within a remarkably short period (2009–2024). A critical component of PSCs is the hole transport material (HTM), which plays a key role in charge transport and device performance. Over the years, numerous HTMs have been synthesized and studied to enhance the efficiency and stability of PSCs.

To gain deeper insights into their photovoltaic properties, extensive computational investigations have been conducted using density functional theory (DFT) and time-dependent DFT (TD-DFT) simulations. The B3LYP/6-311G(d) method was employed to analyze molecular characteristics, including simulated maximum absorption wavelengths, frontier molecular orbitals (FMO), ionization potential (IP), electron affinity (EA), and light-harvesting efficiency (LHE). Additionally, key quantum chemical parameters such as chemical potential ($\mu 0$), chemical hardness (η), chemical softness (S), electronegativity (χ), and electrophilicity index (ω) were evaluated to understand their impact on charge transport and stability.

Further analysis included structural and electronic properties and photovoltaic, all of which were compared against the reference material T26-R. The findings indicate that the modeled molecules (T26-1 to T26-4) exhibit highly tunable optoelectronic properties and enhanced PCE at a significantly lower cost, positioning them as promising candidates for next-generation HTMs.
This research introduces an innovative ensemble design strategy for developing cost-effective HTMs, further advancing the field of organic photovoltaic devices and contributing to the ongoing progress in PSC technology. Enhancing HTMs remains a crucial approach for improving the overall efficiency and commercialization potential of PSCs.

53. Executive Functions and Difficulties in Learning Mathematics Among Sixth-Grade Elementary Students

Mimoun Es-Salmi and Mostafa Ouessrar

Faculty of Educational Sciences, Mohamed V University, Rabat- Morocco

This study aimed to examine the correlation between the functioning of executive functions (inhibition; cognitive flexibility; updating in working memory) and mathematical learning difficulties among the sixth-grade primary school students. The study included 65 participants, 38 females and 27 males, aged between 11 and 13 years, all experiencing difficulties in learning mathematics. Participants underwent the Stroop test to measure the inhibition function, the trail-making task test to measure cognitive flexibility, and the running span task to measure updating in the working memory. A problem-solving test was also administered to measure mathematical learning difficulties. Statistical analysis revealed a positive and statistically non-significant correlation between working memory and mathematical learning difficulties. Similarly, a positive and statistically non-significant correlation was observed between mathematical learning difficulties and cognitive flexibility. In contrast, there is a negative and statistically non-significant correlation between the cognitive inhibition function and mathematical learning difficulties. In conclusion, children struggling with mathematics exhibited deficiencies in their executive functions.

Keywords: executive functions; inhibition; cognitive flexibility; working memory; mathematics learning difficulties.

54. Teacher leadership and student satisfaction: A full latent growth approach to moderated mediation using soft skills and motivation

Oussama Moussaoui, Sanae Mamnoun, and Bouhout Najib

University Sidi Mohamed Ben Abdellah, Morocco

While teaching practices are generally known to influence students' motivation, soft skills, and satisfaction, the impact of transformational Teacher Leadership remains underexplored. This study employs a latent growth approach to moderated mediation to examine soft skills and autonomous motivation (Intrinsic and Extrinsic Identified) effects as mediators along with the controlled forms of motivation (Introjected and External) and amotivation as moderators of the influence of Transformative Teacher Leadership on academic satisfaction. Surveys from 204 students across Moroccan higher education institutions reveal that TTL enhances communication, problem-solving, teamwork, self-management, and leadership skills, which in turn increase academic satisfaction. TTL's influence on intrinsic motivation is mediated by problem-solving, self-management, and leadership skills, while its impact on extrinsic motivation is mediated by leadership skills alone. Controlled motivation weakens TTL's positive effects on self-determination and satisfaction. These findings underscore the critical role of teacher leadership in fostering students' academic satisfaction and self-determination through soft skills development.

Keywords: Academic Satisfaction; Higher Education; Language Departments; Self-Determination; Soft Skills; Transformative Teacher Leadership

55. Moroccan Language Policy and the Status of the English Language in Higher Education

Youssef Laaraj

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The reform of the Moroccan education sector has been the State's major concern and the issue of endless debate over the last decades; yet, despite all the efforts and resources deployed, the education system remains in a state of deterioration. The present research investigates what it believes to be a chief factor in the education system's breakdown: language policy. It focuses on how language education and the choice of the medium of instruction affect the quality and reform of the Moroccan education system. Hence, an investigation is carried out through a mixed-methods approach which involved 312 questionnaire respondents, and 70 interviewees. Questionnaires and interviews were used to collect quantitative and qualitative data from various population categories and education sites. Document analysis is also relied on to decipher the textual information as revealed by the official bodies and highest authorities. The data analysis and interpretation helped to reach significant findings. The collected data has revealed an obvious official promise to promote the teaching of national and foreign languages, a perceptible endorsement of foreign languages in scientific and technical education, and firm pledges to attain the students' mastery of languages. While the state is heading to further enhance the status of French as a means of instruction, the students are expressing wide advocacy for the promotion of English in their education. It also discloses an obvious poor foreign language mastery and a harrowing gap between the official discourse and the situation of language education as most claims are not buttressed by tangible measures.

Keywords: Morocco, Language Policy, English language status, Higher education, Educational policy.

56. Intrinsic motivation: A key factor for academic and clinical success among nursing students

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3 Laboratory of Biology and Health, Faculty of Sciences, Ibn Tofail University, 14000 Kenitra, Morocco

As a major predictor of performance, motivation is a key factor in student engagement and academic success. In the context of nursing education, which integrates both theoretical knowledge and practical skills acquired through clinical learning, it is deemed relevant to study motivation to help students cope with the challenges associated with this psychological aspect throughout their academic career. The aim of our study was therefore to examine the impact of the three main dimensions of motivation - intrinsic, extrinsic and amotivation - on the academic and clinical performance among nursing students. This was a quantitative cross-sectional study with a correlational design, conducted among a sample of 246 students enrolled at the "Higher Institutes of Nursing Professions and Health Techniques" of Taza, for the 2023/2024 academic year. Participants completed both a self-administered questionnaire covering their socio-demographic characteristics (gender, age, marital status, specialty) and the 28-item motivation scale: "The Motivation in Education Scale for secondary education (ÉMÉ-S 28). Students' academic and clinical performance was assessed based on grades obtained in their theoretical and practical learning modules. Quantile regression was used to analyze the impact of motivational dimensions on students' academic and clinical performance. According to our results, intrinsic motivation has a positive effect on students' academic and clinical performance, with significant coefficients for all quantiles: 1.850 ($p < 0.001$) for $q = 0.25$, 2.137 ($p < 0.001$) for $q = 0.50$ and 2.744 ($p < 0.001$) for $q = 0.75$. In contrast, extrinsic motivation and amotivation had no significant impact on clinical performance, but exerted a negative effect on academic performance, particularly for quantiles $q = 0.25$ and $q = 0.75$. It is therefore essential to consolidate and promote intrinsic motivation, as it fosters a deep commitment to learning on the part of students, which will further strengthen their involvement and passion for their future profession.

Keywords: motivation, intrinsic motivation, nursing students, academic performance, clinical performance.

57. Hybrid approach in didactics and leadership development of high school students: case in a rural environment in the Draa Tafilalet region (Morocco)

Mariam Akdim[1], Sabah Selmaoui[2], and Anouar Alami[1]

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The analysis of the interferences between "Transformational leadership in education" and "Hybrid didactics" illustrates the importance of their shared spaces in terms of objectives, implementation conditions and expected results. In both cases, the development of learners' skills is among the central concerns.

Scientific work carried out over the last three years on this theme in rural areas in the Draa-Tafilalet region (Tinghir province) confirms this observation. Through the use of selected hybrid didactics (a combination of experimentation and field tests with monitoring of the work carried out by students at home and their degrees of collaboration outside of class), the results show that the implementation of hybrid didactics to teach life and earth sciences in the common scientific core, allows learners to develop the personal qualities that condition transformational leadership such as critical thinking skills, initiative, collaboration, communication, and will to innovate For example.

The presentation will be structured around the following axes:

- The requirements and conditions of Transformational Leadership in education according to international scientific literature.

- The hybrid didactic approach and its concordances with transformational leadership in education, what interferences?

- Empirical results and tests of interference between hybrid didactics and school leadership, in a rural environment in the Draa-Tafilalet region (province of Tinghir, Morocco).

Keywords: Hybrid didactic approach, leadership, education, Morocco.

58. Study of Pragmatemes: From Linguistic Description to Didactic Application

Itto Mellouki

Doctorante à l'université Moulay Ismail, MEKNES -Morocco

Our study explores the teaching/learning of a specific case of prefabricated expressions, namely pragmatemes. In fact, several research studies have addressed this phenomenon from a lexicological, lexicographical, semantic, or pragmatic perspective, but few studies have examined how to teach them to future generations. In this sense, we ask why teach fixed expressions in general and pragmatemes in particular? Given the complexity of analyzing the phenomenon of fixation and its teaching, this article aims to combine linguistic and didactic knowledge by adopting a phraseodidactic method. Firstly, we will show the importance of teaching these prefabricated expressions, then we will refine the characteristics of pragmatemes. Secondly, we will attempt to translate linguistic knowledge into teaching modalities of these units from an action-oriented perspective. Additionally, we will propose examples of exercises to integrate into the learner's handbook and didactic methods for course development. We will then address the cultural aspect of these prefabricated expressions. Finally, we aim to teach/learn pragmatemes through various digital tools.

Keywords: Phrasal-didactics, pragmateme, teaching/learning, digital pedagogy

59. A comparative study of the educational effectiveness using linear and interactive videos in teaching chemistry at secondary school

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Using a hybrid learning system, video provides autonomous, anticipatory and random access to content. The purpose of the current empirical study was to compare the influence of interactive and linear video on learning outcomes and learner satisfaction in distance and classroom learning environments. Three different contexts were studied: The first and second contexts were a classroom-based learning environments with interactive and linear video. The third was an interactive distance learning environment. Moreover, interactive distance learning and interactive classroom-based learning were carried out simultaneously. The experimental results showed that linear and interactive videos had the same effect on learners' results, whether in the case of distance or classroom training. However, there was a higher level of satisfaction among learners who used the interactive video. Furthermore, the results show that there is no significant difference between classroom or distance learning using interactive video and classroom learning using linear video.
The present study provides important results demonstrating that teaching through linear and interactive video is an effective way to overcome the problem of infrastructure and classroom overcrowding at secondary school.

Keywords: Interactive learning; interactive video; distance learning, chemistry teaching.

ENGINEERING AND COMPUTER SCIENCE AND MATHEMATICS ORAL PRESENTATIONS

1:00 pm – 3:00 pm

Zoom Link

Moderator: Andrea Mayfield

*Undergraduate Presentations **Graduate Presentations

60. *Controllability of Financial Dynamic Systems by Neural Networks

Lamiae Seddati

Université Sidi Mohamed Ben Abd Allah, Morocco

Using neural network-based methods, this work investigates the controllability of nonlinear dynamic systems, particularly those influenced by sigmoid activation functions and related to financial problems. The objective is to demonstrate that control techniques can minimize discrepancies between the system's actual output and a target output or equilibrium point. The approach follows several key steps: first, the system is linearized to facilitate an analysis of state stability and controllability. Next, Pontryagin's maximum principle is applied to theoretically assess controllability and identify the optimal control function. Simulations are performed to validate these findings, employing control approximations through recurrent neural networks (RNNs) and Long Short-Term Memory networks (LSTMs). Finally, a practical application in financial time series forecasting is presented, using the AAPL dataset to illustrate the method's effectiveness in reducing prediction error. This study offers a solid theoretical framework for controlling nonlinear systems and opens promising avenues for complex system management in fields such as finance.

61. *K-Means Algorithms And Industrial Predictive Maintenance Strategy: Proposal Of A Conceptual Research Model To Transform Industry 4.0 In Morocco

Lakhlifi Fatima-Zahrae[1], Idrissi Adil[1], Abdellaoui Mohammed[2], and Habbani Souad[2]

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This paper explores the integration of integrating k-means algorithms into predictive maintenance strategies and their impact on the industrial performance of moroccan factories, with a focus on mediating strategic mechanisms. The primary objective is to propose a conceptual research model grounded in a quantitative methodology, addressing the gap in in-depth studies linking machine learning algorithms to industrial strategies within the context of industry 4.0. The literature review underscores the expanding role of artificial intelligence and machine learning in industrial performance optimization. However, specific research into k-means and their impact on predictive maintenance strategies remains limited. Based on this analysis, five hypotheses have been formulated. In particular, they explore the relationships between data quality, the combination of k-means with other algorithms, organizational adaptation and both direct and indirect industrial performance. These hypotheses form the basis of our conceptual model. The proposed conceptual model is based on a quantitative approach using a multiple linear regression model to analyze the relationships between variables. K-means are modeled as the independent variable, with mediating mechanisms such as cluster quality and resource allocation. Industrial performance, measured by indicators such as cost reduction and productivity improvement, is the dependent variable. In terms of prospects, this research paves the way for more diversified studies on other algorithms and their strategic integration in industry 4.0. Future research could also explore hybrid approaches combining qualitative and quantitative analyses to enrich understanding of the underlying organizational mechanisms.

Keywords: K-means algorithms, Predictive maintenance, Industry 4.0, Morocco, Proposal

62. **Approximation of functional inequalities in quasi-Banach spaces

Jawad Boutarfass

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It is well known that the stability problem of functional equations and inequalities was motivated by a question posed by Ulam in 1940, with a positive answer provided by Hyers the following year. The main purpose of this research is to investigate the generalized stability, in the sense of G.-L. Forti and P. Gavruta, of a general class of linear functional inequalities associated with Jordan-von Neumann type additive functional equation in quasi-Banach spaces. More precisely, using the direct method (commonly referred to as Hyers' method), we prove
that every approximate solution of these functional inequalities in quasi Banach spaces must be close to an exact solution. In doing so, we generalize and extend several results in the literature, including those concerning additive and Jensen inequalities in classic spaces.

Keywords: Ulam stability, approximation, functional inequalities, quasi-Banach spaces.

63. **Urban expansion and development of high value-added industries: localization of small and medium enterprises operating in information technology in the city of Rabat “proposal for a measurement scale based on structural equation models

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This study explores the impact of urban expansion on the emergence and development of small and medium-sized enterprises (SMEs) operating in the information and communication technology (ICT) sector in Rabat namely the capital of Morocco. Small and medium-sized (SMEs) enterprises play a pivotal role in Morocco's economy, contributing significantly to employment, exports, and investments. Rabat, as the political and economic capital, offers a unique environment for economic development, characterized by high population density, administrative concentration, and urban growth. This research investigates how urban expansion, driven by population growth, infrastructure development, and economic diversification, influences the localization and growth of small and medium-sized enterprises operating in sector of information and communication technologies. Drawing on theories of territorial economy, urban economy, and agglomeration economies, the study employs a positivist, hypothetico-deductive methodology to analyze the relationship between urban expansion and localization of these businesses. Data is collected through a multi-scale questionnaire targeting ICT SMEs in Rabat, and structural equation modeling is used to validate the findings. The results highlight the role of urban expansion in fostering a conducive ecosystem for innovation and SME development, emphasizing the importance of strategic infrastructure, agglomeration economies, and territorial positioning. The study contributes to the understanding of how urban dynamics shape the localization of high-value-added industries and offers insights for policymakers and stakeholders aiming to enhance the competitiveness of SMEs in emerging urban economies.

Keywords: urban expansion; territorial marketing; territorial economy; territorial positioning; SMEs (Small and Medium Enterprises); information and communication technologies (ICT).

64. Enhancing Security in Intelligent Transportation Systems: AI-Powered CNN Model for Multi-Class Intrusion Detection in VANETs

Khadija Mouatassim[1], Abdelfettah Mabrouk[2], and Chaimae Ouchicha[3]

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Intelligent transportation systems (ITS) are booming, offering innovative services to improve the safety and efficiency of transportation networks. An essential component of these systems is the vehicular ad-hoc network (VANET), aimed at reducing collisions and securing information in real time.
Security challenges in VANETs are paramount, and intrusion detection systems are crucial to identifying malicious activity. The integration of artificial intelligence (AI) into these systems has shown significant improvement in attack detection, in this paper. We propose a new network intrusion detection model using Convolutional Neural Networks (CNN) for multi-class classification and the Experimental results show that the proposed model is capable of automatically identifying and classifying multiple types of intrusions.

65. Machine Learning and Artificial Intelligence in Biology: Novel Approaches to Medical Image Analysis

Mohammed Zouiten[1], Salma Latik[2], El Ferendy Hassan[1], and Lazrek Hammad[1]

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Machine learning (ML) and artificial intelligence (AI) are increasingly driving innovation in biological sciences, particularly in medical imaging. This study presents a newly developed convolutional neural network (CNN) architecture tailored for lung tumor detection using chest X-ray images. Leveraging a dataset of 50,000 diverse cases, including both normal and pathological images, our model incorporates attention mechanisms and a multi-modal approach by combining imaging, clinical, and genomic data. This unique architecture achieved high performance metrics: an accuracy of 92%, sensitivity of 90%, and specificity of 94%. These results surpass traditional methods such as Support Vector Machines (SVMs) and Random Forests (RFs). The research also discusses the opportunities and challenges of deploying AI-driven solutions in different contexts, with a specific focus on Morocco and the United States, providing a comprehensive analysis of AI's impact in diverse healthcare systems.

66. A Novel Method for Accurate Medical Image Segmentation

Chaimae Ouchicha

Department of Management Assistance Techniques, Hassan 1st University (UH1), ENCG, Settat, Morocco

Image segmentation is one of the most important and challenging processes in medical image analysis, particularly for Magnetic Resonance Imaging (MRI) brain scans. Accurate segmentation of brain tissues, such as gray matter, white matter and cerebrospinal fluid, is essential for diagnosing neurological disorders and conducting research. However, traditional segmentation methods often struggle with noise, intensity inhomogeneity, and the overlapping nature of tissue intensities in MRI data. In this context, we propose a novel approach to MRI brain segmentation using fuzzy clustering, which addresses these challenges by incorporating spatial information and handling uncertainty in voxel classification. Experiments were conducted on publicly available MRI datasets, and results show that the proposed fuzzy clustering approach outperforms traditional FCM and other state-of-the art methods in terms of segmentation accuracy and robustness to noise. The proposed algorithm demonstrates significant potential for clinical applications where accurate brain tissue segmentation is crucial.

Keywords: processing, Magnetic resonance images, Brain tissue segmentation, Noise, Fuzzy clustering, Convergence analysis.

67. High-Accuracy Pseudospectral Methods for Fractional Differential Equations and Optimal Control: New Approaches for Complex Systems

Kareem T. Elgindy

Ajman University, UAE

Fractional differential equations and fractional optimal control (FOC) problems have emerged as powerful tools for modelling complex systems exhibiting memory effects and non-local interactions. However, challenges remain in developing accurate and efficient numerical methods, particularly for problems involving periodic behaviour or higher-order fractional derivatives. This talk presents two novel pseudospectral methods designed to address these challenges. First, we introduce a shifted Gegenbauer pseudospectral method for approximating Caputo fractional derivatives of arbitrary positive order. By transforming the Caputo derivative into a scaled integral and employing properties of shifted Gegenbauer polynomials, we mitigate singularity issues and construct a highly accurate and efficient scheme. This method leads to a fractional shifted Gegenbauer integration matrix, enabling rapid computation of Caputo derivatives. Second, we present a Fourier-Gegenbauer pseudospectral method for solving periodic higher-order FOC problems. This approach utilizes recently developed periodic fractional derivatives that preserve periodicity, combined with specialized quadrature rules to achieve exponential convergence. We demonstrate the effectiveness of both methods through rigorous theoretical analysis and numerical examples, demonstrating their superior accuracy and efficiency compared to existing techniques, particularly for challenging problems such as periodic FOC and Bagley-Torvik type boundary value problems. These new methods offer valuable tools for a wide range of scientific and engineering applications involving fractional dynamics.

1:00 pm – 3:00 pm

Zoom Link

Moderator: Kirstan Cunningham and Kim Giles

*Undergraduate Presentations **Graduate Presentations

68. *New Quinazolinone-Triazole Hybrids: Synthesis, Characterization, and Vasorelaxant Properties

Yassine Rhazi[1], Aziz Arzine[1], Mohammed El mesky[2], Fatima Nouayti[1], Asmae Nakkabi[2], Mohammed Chalkha[2], Mohamed Bakhouch[3], and Mohamed El Yazidi[1]

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Azoles are a class of heterocyclic compounds characterized by one or more nitrogen atoms within their aromatic ring. Due to their diverse chemical and biological properties, they are widely explored and applied in organic chemistry, pharmacology, and agrochemistry. Among the most common azoles, quinazolinones and 1,2,3-triazoles are pharmacophores frequently found in the structure of various drugs and synthetic compounds with promising biological activities.

The combination of these two pharmacophores within a single molecule represents an innovative approach to designing new hybrid compounds with synergistic effects. Motivated by the significance of molecular hybridization strategies and in line with our ongoing research on the development of new bioactive compounds, this study presents the synthesis, characterization, and evaluation of vasorelaxant activities of novel hybrid heterocyclic systems incorporating quinazolinone and 1,2,3-triazole cores.

Keywords: Quinazolinone, 1,2,3-triazole, vasorelaxante activity.

69. *Advancing Breast Cancer Immunotherapy: The Role of Hydrogels in Enhancing Therapeutic Precision and Efficacy

Muhammad Farhan

Ajman University, UAE

Introduction: Hydrogels have gained significant attention in cancer immunotherapy for their ability to improve drug delivery systems, particularly in the treatment of breast cancer. Their unique properties allow for precise targeting of tumor sites, controlled drug release, and modulation of the tumor microenvironment, which can enhance the immune system's response to cancer cells. Despite advancements in immunotherapy, challenges like systemic toxicity and inadequate targeting of solid tumors persist.
Objectives: This review aims to evaluate how hydrogel-based systems can advance breast cancer immunotherapy by enhancing drug delivery precision, reducing systemic side effects, and boosting immune responses at tumor locations.
Methods: A comprehensive literature review was conducted, focusing on recent preclinical and clinical studies that explore hydrogel applications in breast cancer immunotherapy. Various hydrogel formulations, including biodegradable and stimuli-responsive types, were analyzed for their effectiveness in drug encapsulation, controlled release, and immune activation.
Results: The analysis revealed that hydrogels significantly improve the targeting and efficacy of immunotherapeutic agents. By enabling localized and sustained drug release, hydrogels minimize exposure to healthy tissues and reduce systemic toxicity. Additionally, certain hydrogel formulations can respond to tumor-specific stimuli, further enhancing drug delivery precision. Hydrogels also facilitate a more robust immune response by modulating the tumor microenvironment and promoting the infiltration of immune cells.
Conclusion: Hydrogels offer a promising strategy to overcome current limitations in breast cancer immunotherapy. Their ability to deliver drugs precisely and modulate immune responses at the tumor site can lead to more effective and less toxic treatments. Ongoing research is essential to address challenges related to clinical scalability, integration with existing therapies, and cost-effectiveness.

Keywords: Hydrogels, Breast Cancer, Immunotherapy, Drug Delivery, Tumor Microenvironment, Immune Activation, Targeted Therapy

70. *Mediterranean Diet Adherence Score, Nutritional Profile and Incidence of Gestational Diabetes in Pregnant Women From the Province of Safi (Morocco)

Hamid Chamlal[1], Hassan Beddaa[1], Younes Azemmour[1], Fahd Elkhaloufi[1], Abedaljabbar Rouani[1], Khalid Barkat[2], Rachid Fares[3], and Rekia Belahsen[4]

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The nutrition of pregnant women is one of the challenges for Moroccan health authorities. A healthy and balanced diet based on the principles of the Mediterranean diet (MD) is a potential way to prevent several dietary deficiencies and avoid risks, particularly in women with gestational diabetes (GD). This work aims were to examine the association between adherence to the (MD) and nutritional status, among diabetic pregnant women in the city of Safi in Morocco. A cross-sectional, correlational and analytical study conducted over a period of 17 months, from October 2018 to February 2020, targeted 401 pregnant women attending antenatal consultation (ANC) services in eight health centers (HCs). MD adherence was assessed by the MDS-P score, based on the simplified MD score in addition to the specific needs for Iron, Calcium (Ca) and folic acid during pregnancy. Results were processed using statistical operations such as correlations, comparison, and ANOVA analysis of variance. The study shows that adherence to the MD was low in 33.9%, moderate in 65.1%, and high in 1% only. The data also revealed that the MD adherence score was not significantly associated with the incidence of GD ($p>0.05$), while a significant association was found with nutritional status in the majority of cases ($p<0.001$). Maintaining the Mediterranean dietary model in Morocco plays a crucial role in public health as it protects against gestational diabetes and several metabolic diseases.

Keywords: Mediterranean diet Adherence score, Gestational diabetes, Nutritional status, Nutrition.

71. *Cybersecurity Post-Covid and the Threat to Healthcare Data: A Disaster Without Control

Zaid Abu El-Ata

Ajman University, UAE

This research paper explores one of the most relevant issues in today's healthcare: cybersecurity. Cybersecurity refers to the practice of securing data. Healthcare data contain highly sensitive information, making it a target for theft. This became a pressing issue during and post-Covid, exposing many vulnerabilities in organizations' systems. This breach of privacy costs healthcare millions of dollars, not to mention the financial risk it puts patients in. It also costs something more important: the patients' lives and well-being. Thus, it is vital to utilize every resource to protect hospitals against cyberattack threats. This research aims to educate about the types of cyberattacks and the methods hackers use to steal data. It explores the reason behind each method's success, and which factors may be involved, including technical and psychosocial. In addition, it takes a look at what makes healthcare susceptible to such attacks and which financial and systemic elements are at play. A literature review of multiple studies was done to analyze what obstacles exist in the face of a secure healthcare, and how to overcome them. The review suggests the strong need for mitigation strategies, and explores which are most effective to promote and strengthen cybersecurity. Finally, it examines the long-term implications for healthcare delivery. In conducting this research, I hope to contribute to a better understanding of this issue and shed light on the best solutions.
In the face of AI development and the rapid growth of data, the paper implores healthcare organizations to take the matter seriously and implement the regulatory changes necessary, as well as prioritize supporting hospitals with the resources they need to protect their data. If they fail to do so, the consequences can only be severe.

72. *Cytokine and Chemokine Profiling in COVID-19: Immune Signatures Associated with Disease Severity

Maryam Bourhis [1], Abderrazak Idir [1,6], Safa Machraoui [2], Abdelhamid Hachimi [3], Youssef Elouardi [4], Oumayma Jamil [4], Mohammed Khallouki [4], Kawtar Zahlane [5], Morad Guennouni [6], Raja Hazime [2], Lamiaa Essaadouni [7], Bouchra Lourhlam [1], Moulay Mustapha Ennaji [8], Hassan Ait Mouse [1], Brahim Admou [2], and Abdelmajid Zyad [1]

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Introduction COVID-19 is a viral infection that significantly disrupts the host immune system, leading to an excessive release of pro-inflammatory cytokines, a phenomenon known as the "cytokine storm." This immune dysregulation plays a critical role in disease progression and severity, contributing to complications such as acute respiratory distress syndrome (ARDS) and multi-organ failure. Understanding the profile of cytokine and chemokine expression in COVID-19 patients is essential for identifying potential biomarkers of disease severity and guiding therapeutic strategies.
Objective The present study aims to assess the serum levels of 27 protein biomarkers, including cytokines and chemokines, to investigate their correlation with COVID-19 severity. By analyzing these immune mediators, we seek to identify specific inflammatory patterns associated with different stages of the disease.
Methods A total of 89 COVID-19 patients with varying degrees of disease severity—categorized as asymptomatic (n = 14), moderate (n = 14), severe (n = 30), and critical (n = 31)—were included in the study, along with 14 healthy individuals as controls. Serum levels of 27 cytokines and chemokines were measured using the Luminex-based Bio-Plex Pro Human Cytokine assay (Bio-Rad™). The obtained data were analyzed to determine associations between specific immune markers and disease severity.
Results Key findings from our study indicate that IL-12, IL-2, and IL-13, along with IL-17 and GM-CSF, were undetectable in asymptomatic patients, suggesting a lack of significant immune activation in this group. Interestingly, IL-8 levels were found to be higher in asymptomatic individuals compared to other groups, indicating a potential role in early immune response. As the disease progressed, markedly elevated levels of IL-6, IL-10, and the chemokines MIP-1α, MCP-1, and IP-10 were observed, correlating with increased disease severity. Conversely, IL-4 levels exhibited a decreasing trend with

worsening disease conditions, suggesting a shift in immune balance towards a pro-inflammatory state.
Conclusion Our findings reinforce the notion that excessive cytokine production is closely linked to COVID-19 progression. The differential expression of cytokines and chemokines across disease severity levels highlights the potential of these biomarkers for monitoring disease progression and guiding therapeutic interventions. Further investigations are warranted to explore their utility in predicting outcomes and developing targeted treatments for severe COVID-19 cases.
Keywords: SARS-CoV-2; COVID-19; Cytokine storm; Cytokine profiling; Chemokine; Disease severity; Immune response

73. **Syzygium aromaticum hydro alcoholic extract causes anticancer effects in DBA2 mice

Bouchra Lourhlam [1], Abderrazak Idir[2], Abdelmajid Zyad[1] and Hassan Ait Mouse[2]

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2 Research team on Experimental Oncology; Natural Substances, Cellular Immunopharmacology, Immunology of CancerCells. Faculty of Sciences and Technology, Sultan Moulay Sliman University, Beni Mellal, Morocco Science and Technology Team

Medicinal and aromatic plants are increasingly recognized for their rich composition of naturally occurring chemical compounds with potential anticancer properties. Among these, Syzygium aromaticum, commonly known as cloves, has garnered attention for its potent bioactive constituents such as eugenol, which exhibit antioxidant, anti-inflammatory, and anticancer activities. This study aimed to evaluate the antitumor effects of hydroalcoholic extracts of cloves using an in vivo murine mastocytoma carcinoma model to provide preclinical evidence of their therapeutic potential. The hydroalcoholic extract of Syzygium aromaticum was administered orally to mice at three different concentrations: 100 mg/mL, 200 mg/mL, and 400 mg/mL, over a 26-day experimental period. Daily monitoring of mouse weight and tumor volume was performed to assess the impact of the treatment on tumor progression and overall health. Histopathological analysis was conducted on the mastocytoma carcinoma post-sacrifice to examine cellular and structural changes induced by the treatment. Results demonstrated that higher concentrations of the extract (200 mg/mL and 400 mg/mL) were associated with significant tumor volume reduction compared to the control group. This was accompanied by notable histopathological alterations indicative of reduced tumor cell viability and progression. Additionally, the extract showed no adverse effects on the weight or general health of the mice, highlighting its potential safety for therapeutic use.These findings suggest that hydroalcoholic extracts of Syzygium aromaticum could serve as a promising natural agent in anticancer therapies. However, further studies focusing on the precise molecular mechanisms, bioavailability, and long-term effects are essential to fully establish its clinical applicability in combating cancer.

Keywords: *Syzygium aromaticum, antitumor effect, Hydroalcoholic extract, In vivo model, Histopathology*

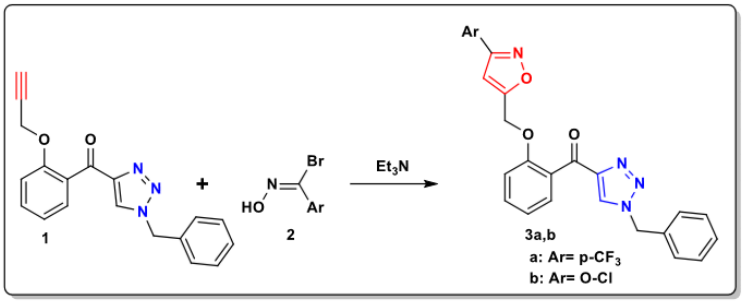
74. **Novel Triazole-Isoxazole Hybrids As Antibacterial Agents: Design, Synthesis, Characterization

Rachid Bouzammit, Youssra Kanzouai, Mohamed Bakhouch, Asmae Nakkabi, and Ghali Al Houari

University Sidi Mohamed Ben Abdellah, Morocco

Heterocycles constitute the largest traditional category in organic chemistry and hold significant importance both biologically and industrially [1,2]. A large proportion of biologically active drugs and agrochemical products are heterocyclic compounds.

Chromone derivatives and triazoles exhibit notable biological activities, including antioxidant [3], anticancer [4,5], and anti-inflammatory properties [6], In this context, the aim of this work is to synthesize new hybrid compounds bearing the 1,2,3-triazole and isoxazole rings, which could potentially exhibit antibacterial activity. This is achieved by a 1,3-dipolar cycloaddition reaction between propargyl traizole (1) with arylnitrile oxides (2), followed by evaluation of their antibacterial activity. This reaction is illustrated in the diagram below [7].



Scheme. Method for synthesizing compound 3a,b.

The structure of prepared compound 3a,b was established using various spectroscopic techniques such as mass spectrometry, 1H and 13C NMR. The results of the analysis are in good agreement with the proposed structures of the triazole-isoxazole hybrid [7].

75. **Genetic analysis in complex hereditary diseases: improving diagnosis and management

Khawla El Fizazi[1,2], Laila Bouguenouch[1,2], Karim Ouldim[1,2], and Mohammed Ridal[3].

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The diagnosis of hereditary diseases with complex clinical presentations remains a significant challenge in medical genetics. Advanced genetic analysis provides a robust approach to uncovering the molecular basis of such conditions, offering insights that can improve patient care.

In this study, we investigated a Moroccan consanguineous family with a patient presenting an unusual manifestation of a hereditary disease, which did not align with any known condition and had remained undiagnosed despite thorough clinical and genetic evaluations. Using next-generation sequencing (NGS) technologies, specifically whole exome sequencing (WES), we identified a novel pathogenic variant in a gene associated with autosomal recessive inheritance. This enabled a precise molecular diagnosis, guiding personalized management and offering valuable information for genetic counseling.

This underscores the critical role of NGS in overcoming diagnostic challenges in complex hereditary diseases. By elucidating the genetic etiology, it contributes to a better understanding of the disease, expands the mutational spectrum, and enhances clinical management strategies for complex disorders."

76. **The study of the genomic diversity of *Leishmania infantum* in Morocco

Sara El Mazini [1,2], Khadija Bekhti [2] and Meryem Lemrani [1]

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Leishmania infantum is a major pathogen of both veterinary and public health significance worldwide. In Morocco, it is the causative agent of both visceral and cutaneous leishmaniasis in humans and dogs. Despite its clinical importance, no genomic studies have been conducted on this species in Morocco. To address this gap, we undertook the first exploration of its intraspecific genomic diversity. Our analyses revealed variability in ploidy levels, which were generally specific to each isolate. Gene copy number variation (CNV) analysis showed that most affected genes are associated with virulence, infectivity, and parasite survival. Additionally, principal component analysis (PCA) and SNP-based dendrograms demonstrated a marked divergence between the two cutaneous isolates and the other strains.

Keywords: *Leishmania infantum*; visceral leishmaniasis; cutaneous leishmaniasis; genetic diversity; MLST; genomic diversity; aneuploidy; CNV; SNP; Morocco.

77. **Conception of inhibitors by 3D computer modeling targeting the breast cancer

Sara Zarougui and Menana Elhallaoui

LIMAS, Department of Chemical Sciences, Faculty of Sciences Dhar El Mahraz, Sidi Mohamed Ben Abdellah University, Fez 30000, Morocco.

The work focused on developing new inhibitors of the MCF-7 cell line, which is contributors to our understanding of breast cancer biology and various experimental techniques. 3D QSAR-modeling were used in order to design new tetrahydrobenzo [4, 5] thieno [2, 3-d] pyrimidines derivatives with good characteristics. Two robust 3D-QSAR models were developed, and their predictive capacity was confirmed by the high correlation: COMFA (Q^2 = 0.62, R^2 = 0.90) and COMSIA (Q^2= 0.71, R^2= 0.88) with an external validation R^2_{ext}=0.90, R^2_{ext}= 0.91 respectively. Successful evaluation confirms the models' potential for reliable predictions. Six candidate inhibitors were discovered, and two new inhibitors were developed in silico using computational methods. The ADMET properties and pharmacokinetics characteristics of those new derivatives were carefully evaluated. The interactions between new tetrahydrobenzo [4, 5] thieno [2, 3-d] pyrimidines derivatives and the protein ERα (PDB code: 4XO6) have been highlighted by molecular docking. In addition, MM/GBSA calculations and molecular dynamics simulations provided interesting information on the binding stability between the complexes. The pharmaceutical characteristics, interaction with protein and stability of the inhibitors were examined using various methods including docking molecular, molecular dynamics simulations during100 ns, binding free energy calculations, and ADMET predictions, in comparison to the FDA-drug Capivasertib. The findings indicate that the inhibitors exhibit significant binding affinity, robust stability, and desirable pharmaceutical characteristics. These newly projected compounds, which act as inhibitors to mitigate breast cancer possess considerable potential as prospective drug candidates.

HEALTH AND MEDICINE ORAL PRESENTATIONS SESSION 2

1:00 pm – 3:00 pm

Zoom Link

Moderators: Kaleigh Pate and Kirstan Cunningham

78. Highly Absorbent 3D-Printed Hydrogel with Phytotherapeutic Properties for Wound Healing Applications

Anouar El Ghazal[1], Sena Su[2], Oguzhan Gunduz[2], Saad Ibnsouda Koraichi[1], Khalil El Mabrouk[3], and Soumya El Abed[1*]

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Wound care remains a significant global health concern, affecting millions worldwide. Traditional wound dressings often struggle to control infections, particularly in the presence of excessive exudate, posing a major challenge for effective treatment. In this study, we focused on the extraction and characterization of three plant-derived bioactive compounds with potential integration into 3D-printed Gelatin (Gel)/Alginate (Alg)/Zeolite (Zeo) scaffolds for advanced wound healing applications. Ten different Gel-Alg formulations were investigated by varying their concentrations while incorporating 1% zeolite. The scaffolds were characterized for printability and viscosity using scanning electron microscopy (SEM) and rheometry, respectively. Additionally, mechanical properties, swelling behavior, and biodegradation were evaluated. The extraction yield, antibacterial efficacy, and antioxidant activity of the plant extracts were also examined. Results indicated that a scaffold containing 9% gelatin and 3% alginate exhibited excellent printability, increased viscosity at higher Gel-Alg concentrations, and favorable mechanical properties. The optimized 3D-printed scaffold demonstrated biodegradability and superior absorption capabilities. Furthermore, the plant extracts exhibited remarkable antibacterial and antioxidant activities. Overall, these findings underscore the potential of Gel/Alg/Zeo scaffolds as an innovative platform for delivering plant-based bioactive compounds, presenting a promising strategy for enhancing wound healing by efficiently managing exudate and preventing bacterial infections.

Keywords: 3D Printing, Gelatin/Alginate, wound healing, Plant extracts, Wound dressings, Excessive Exudate Management.

79. Harnessing Algae: A Multifaceted Approach to Sustainable Solutions in Environment, Agriculture, and Health

Salma Latique[1], Mohammed Zouiten[2], and Abdeslam Elkartouti[1]

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2 Sidi Mohammed Ben Abdelah University of fez, Polydisciplinary Faculty (FP) TAZA, Laboratory LISA of ENSA, Fez Morocco

As the world grapples with significant challenges such as climate change, food security, and public health, the need for innovative and sustainable solutions has never been more critical. Algae, a versatile resource, offer unique opportunities to address pressing issues related to environmental sustainability, agricultural resilience, and health enhancement, particularly in Morocco and the United States. These remarkable organisms, including cyanobacteria, diatoms, green algae, and euglenophytes, function as natural carbon sequestrators, absorbing substantial amounts of atmospheric carbon dioxide while releasing oxygen during photosynthesis. This paper explores the multifaceted applications of algae, presenting methodologies, mathematical models, and empirical comparisons that demonstrate their potential in various sectors.

80. Isoxazole Compounds: Synthetic Strategies, Structural Characterization, and Evaluation of Their Antibacterial Potential

Aziz Arzine[1], Yassine Rhazi[1], Najoua Barghady[1], Mohammed Chalkha[2], Asmae Nakkabi[2], Mohamed Bakhouch[3], and Mohamed El Yazidi[1]

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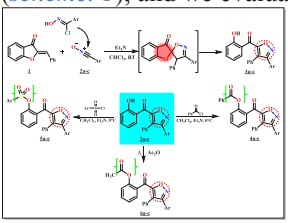
3 Laboratory of Bioorganic Chemistry, Department of Chemistry, Faculty of Sciences, Chouaïb Doukkali University, P.O. Box 24, 24000 El Jadida, Morocco.

Pathogenic bacteria are a major cause of serious infections and global health crises, exacerbated by increasing drug resistance due to genetic mutations and antibiotic misuse[1]. This multidrug resistance increases morbidity and mortality and underscores the urgent need for new, potent antibacterial therapies[2]. Heterocyclic compounds play an important role in drug discovery because they offer a variety of biologically active structures. Medicinal chemists modify these molecules to improve efficacy and safety[3]. Advances in heterocyclic chemistry have expanded their use in therapeutic, agrochemical and industrial applications[3]. Among these, isoxazoles stand out for their wide range of biological activities, including antihistaminic, antifungal, antimicrobial, antiviral, anti-inflammatory, antioxidant, and anticancer properties. They are also used in herbicides, fungicides, insecticides and anti-corrosive coatings, with several marketed drugs incorporating isoxazole as a key pharmacophore. Isoxazoles also serve as precursors for bioactive molecules such as amino acids and amino alcohols[4–7]. Building on the promising results obtained with isoxazole derivatives in various fields and our ongoing research into the synthesis and evaluation of new heterocyclic compounds, we present the synthesis and spectroscopic characterization of a new series of isoxazoles. These compounds contain sulfonate esters as well as benzoyloxy and acetoxy groups (*scheme. 1*), and we evaluate their antibacterial activity[8,9].



Scheme 2: Synthetic route of functionalized isoxazole compound 4, 5 and 6.

Keywords: heterocycles, 1,3-dipolar cycloaddition, tosylation, aurone, isoxazoles, antibacterial activity

81. Selective Direct Oxidation of 1-Butanol Into Acetal Using H2O2 and Cs5MPW11(H2O)O39(M=Fe, Co, Cu) Catalysts

Farah Lachquer[1] and Jamil Toyir[2]

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Direct catalytic oxidation of alcohols to acetals in one step process is very attractive, because the two steps process leads firstly to aldehydes, which are unstable species serving as reactive intermediates to generate several by-products reducing process efficiency and selectivity. In our study, a new selective catalytic acetalization of 1-butanol into 1-1 dibutoxybutane acetal using H_2O_2 in one step process is investigated using Keggin-type polyoxometalates catalysts. The materials developed consisted of new lacunary phophotungstate salts Cs_5MPW_{11} $(H_2O)O_{39}$ (M = Fe, Co and Cu) which were prepared by inorganic solution condensation method and characterized using XRD, IR, SEM and EDX analysis to verify their structure, surface morphology and chemical composition. $Cs_5CuPW_{11}(H_2O)O_{39}$ catalyst allowed the highest performance for the oxidation of 1-butanol at 60°C using H_2O_2 excess with a yield approaching 92% and a turnover number of 784. Such activity is related to a bifunctional behavior of the catalyst as superacid and redox operating system and the synergistic effect created between the $[PW_{11}O_{39}]^{7}$- Keggin framework, C^{s+} and Cu^{2+}.

Keywords: Lacunary polyoxometalate salts; green oxidation; catalytic acetalization; 1-butanol; acetal.

82. The anxiolytic, anti-depressive, and antioxidative effects of Lemon verbena in rat rendered diabetic by Streptozotocin injection

Oumaima Abouyaala[1], Soukaina Bougrine[1], Fath Alah Elwahab[2], Mohammed Yassine El Brouzi[1], Sara Brikat[1], Noura Rahmouny[1], Marouane El Arbaoui[1], and Moulay Laarbi Ouahidi[1]

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2 Laboratory of Plant, Animal, and Agro- Industry Productions, Faculty of Science, Ibn Tofail University, Kenitra, Morocco.

Background: Many studies about the anxiolytic and antidepressant of Lemon verbena (LV) were found, but no studies delineated a direct link between affective disorders in diabetics and the mechanism of LV effect on neurobehavioral disorders.

Objective: The current study aimed to investigate if treatment with LV methanolic extract (LVME) improves hyperglycemia-related affective disorders by mitigating oxidative stress in rats rendered diabetic by streptozotocin (STZ).

Methods: After intraperitoneal injection of STZ, experimental diabetes was induced and confirmed. Then, the normal rat received distilled water, however, three diabetic group rats were treated with LVME, Metformin, for 28 days respectively. The examination of affective disorders was assessed using the neurobehavioral test, and the prefrontal cortex (CPF) oxidative stress (OS) markers were evaluated also.

Results: Our study revealed that treatment with LVME reversed the STZ effect on behavioral disorders in the OFT, EPM, and FST demonstrating their anxiolytic, and antidepressive effect. This can be explained by the amelioration of antioxidant enzymes, and reduction in oxidant markers at the PFC in the treated group with LVME.

Conclusion: The LVME ameliorated the anxiety and depression-like effects in rats rendered diabetic by STZ-injection, which its antioxidant activity in PFC region might explain.

Keywords: LVME, Streptozotocin, anxiety, depression, oxidative stress

83. Direct acetalization of 1-butanol in the presence of H2O2 and nanostructured Keggin heteropolysalts catalysts

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Acetals are valuable chemical compounds, widely used in the pharmaceutical, perfume and polymer industries. They are also used as additives in fuels such as gasoline and diesel. Our study investigates the development of efficient catalytic systems for the direct oxidation of alcohols to acetals. The materials developed are lacunary polyoxometalates salts Cs5MnPW11(H2O)O39 and Cs5MnPMo11(H2O)O39 synthesized by inorganic condensation in solution method, and were characterized by XRD, IR, SEM and EDX. The Cs5MnPW11(H2O)O39 catalyst displayed outstanding performance in the production of 1,1-dibutoxybutane. This remarkable activity results from its bifunctional behavior, combining superacidity and redox system properties, as well as the synergistic effect between the Keggin structure [PW11O39]7-, Cs+ and Mn2+.

Keywords: Keggin heteropolysalts; nanostructured catalysts; tungsten; acetalization; 1,1-dibutoxybutane.

84. Discovery of new anticancer agents targeting the LSD1 enzyme using a computer-aided drug design approach

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In this work we performed a 3D-QSAR study to develop two reliable 3D-QSAR models, capable to predict the biological activity of new molecules in an efficient manner. The reliability and efficacy of the developed models were validated by internal validation, external validation, and the Y-randomisation test. Based on the interesting information obtained from the CoMFA and CoMSIA contour maps, we designed five new moleculesT1-T5. The LSD1 inhibitory activities of the newly designed molecules were predicted in silico, and the results obtained show that these molecules have a higher inhibitory activity of LSD1 than the most active synthesized molecule N5. The five designed LSD1 inhibitors were subjected to the drug-likeness and ADMET properties test. The results of this test show that two molecules T4 and T5 are non-toxic and have good pharmacokinetic properties compared with a synthesized molecule N5. The two molecules T4 and T5 chosen for their ADMET properties were analysed by molecular docking simulation. The obtained results show the two molecules T4 and T5 are more localized and more stable in the LSD1 pocket than the molecules N°5. Finely, the new designed molecules T4 and T5 were proposed as the best candidates to obtain a better inhibition of LSD1 compared to the synthetized molecule N5.

Keywords: LSD1; 3D-QSAR; Drug-likeness; ADMET; Molecular docking.

85. Women's wishes and needs in terms of knowledge about sexuality and fertility in relation to female cancers: a review of the literature

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The treatment of female cancers, including breast and gynaecological cancers, has a major impact on patients' fertility and sexual health, affecting their quality of life. This review aims to explore women's expectations and needs in terms of knowledge about sexuality and fertility in relation to these diseases. **Methods:** A literature search was conducted in the Scopus and PubMed databases, in French and English, using the keywords: ‘sexuality’, ‘fertility preservation’, ‘women's cancer’, and ‘patients’ needs'. **Results:** The results indicate that patients express a crucial need for information on the effects of treatments on their fertility as well as on preservation options, such as cryopreservation of ovocytes, embryos and ovarian tissue. However, a number of obstacles stand in the way of access to these strategies, including their high cost, lack of coordination between the various healthcare professionals and inadequate training of healthcare staff.In terms of sexuality, major concerns include sexual dysfunction, vaginal dryness, pain and reduced libido, often exacerbated by altered body image. In addition, patients report a lack of communication with healthcare professionals, limiting access to appropriate advice. **Conclusion:** Addressing the reproductive and sexual health concerns of women with female cancers requires a comprehensive, multidisciplinary approach. This includes preserving fertility, managing sexual dysfunction, providing psychological support and implementing preventative measures to improve overall quality of life. Regular communication and counselling from trained healthcare professionals is essential to support these women throughout their cancer journey.

Keywords: sexuality, fertility preservation, gynaecological cancer, breast cancer, need, advice, information

INTERDISCIPLINARY ORAL PRESENTATIONS

1:00 pm – 3:00 pm

Zoom Link

Moderator: Sidney Freeman
*Undergraduate Presentations **Graduate Presentations

86. **Electrochemical analyses pertaining to elevated voltage cathode materials utilized in sodium ion battery systems

Ghizlan En-Nabety[1], Safiya Es-Sehli[1], Rachid Essehli[2], and Mustapha Taleb[1]

1 Department of Chemistry, Faculty of Sciences Dhar El Mahraz, Sidi Mohammed Ben Abdallah University, Fez, Morocco
2 Electrification and Energy Infrastructures Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA

The electrochemical characteristics and behaviors associated with the carbon-coated compound known as Na 4 Ni3 (PO 4) 2 P 2 O 7 have been meticulously assessed and evaluated for its potential utility as a high-voltage positive electrode material specifically designed for application in sodium-ion battery systems. Notably, Na 4 Ni3 (PO 4) 2 P 2 O 7 is distinguished by exhibiting an exceptionally high M 3+ /M 2+ redox potential, quantified at an impressive 4.8 V when referenced against the standard sodium ion half-cell reaction Na + /Na, alongside a theoretical capacity that reaches a maximum value of 127 mAh g −1, which underscores its efficacy in energy storage applications. In this scholarly discourse, we present a comprehensive report detailing the experimental findings pertaining to the electrochemical performance of both Na 4 Ni 3 (PO 4) 2 P 2 O 7 in conjunction with reduced Graphene Oxide and the carbon composites derived from Na 4 Ni 3 (PO 4) 2 P 2 O 7, all of which have been subjected to various sodiation processes to elucidate their respective electrochemical behaviors. The selection of high-voltage dimethyl carbonate-based electrolytes has been strategically made in order to facilitate the exploration and subsequent measurement of the electrochemical properties exhibited by the Na 4 Ni 3 (PO 4) 2 P 2 O 7 cathode materials.

87. **Charting the Evolution from Multichannel to Omnichannel Banking: A Bibliometric Analysis and Future Directions in Digital Banking Technologies

Houmami Chayma and Lafraxo Younes

CADI AYYAD UNIVERSITY, Faculty of Law, Economic, and Social Sciences- , Department of Management Sciences- Marrakech – Morocco

The banking sector has undergone a significant transformation, moving from traditional single-channel approaches to adopting multichannel, cross-channel, and ultimately omnichannel strategies to meet the evolving needs of tech-savvy customers. However, existing research lacks a holistic analysis that maps the development of digital banking technologies, especially regarding customer interaction models. This study addresses this gap by conducting a bibliometric analysis of research published from 2000 to 2024, based on the Scopus database, to trace the evolution from multichannel systems to omnichannel platforms. The analysis identifies key trends and research gaps in the adoption of digital banking, providing insights into the sector's responses to demands for seamless, integrated services. This study emphasizes the need for future research to focus on underexplored areas and the conceptual foundations that shape the development of digital banking technologies. Findings offer valuable guidance for future innovations, aiming to enhance customer experiences and operational efficiency in an industry characterized by rapid technological change.

Keywords : Multichannel, Cross-Channel, Omnichannel, Adoption, Banking sector, Digital Transformation, Bibliometric Analysis.

88. **Enhanced Electrochemical Performance in Cr (VI) Sensing using $Ti_3C_2T_x$/PANI Structure Enabled by PANI Interlayer

Simranjeet Singh and Praveen C Ramamurthy

Interdisciplinary Centre For Water Research (ICWaR), India

This study reports the synthesis of a novel MXene/Polyaniline (MXene/PANI) composite via chemical oxidative polymerization of aniline monomers on Ti_3C_2Tx-MXene layers. Functional groups on the MXene surface (-O and -OH) act as nucleation sites, enabling uniform PANI deposition. The resulting composite exhibits a porous structure, enhancing electrolyte ion interaction and electrochemical performance. Comprehensive physicochemical characterization using FTIR, XRD, TGA, XPS, Raman spectroscopy, and SEM-EDS reveals the structural and compositional attributes of the composite. The MXene/PANI composite was integrated onto an electrode surface and successfully employed for detecting Cr(VI) in environmental samples, demonstrating its potential as a robust sensing material for heavy metal detection.

89. **Antimicrobial and Antioxidant 3d-Printed Wound Dressings: Engineering Bioactive Scaffolds with Pomegranate Peel Powder and Essential Oils for Enhanced Healing and Infection Control

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2 Belfast School of Pharmacy, Queen's University, 97 Lisburn Road, Belfast BT9 7BL, United Kingdom

The ongoing pursuit of advanced wound dressings faces persistent challenges in balancing antimicrobial efficacy, biocompatibility, and environmental sustainability. This study presents a novel approach to 3D-printed wound dressings by integrating Moroccan pomegranate peel powder (PPP) with two potent essential oils, *Mentha pulegium* (MPEO) and *Rosmarinus officinalis* (ROEO). These bioactive components were incorporated into a synthetic polymer Eudragit (EUD) and PPP matrix through 3D bioprinting, preserving their active properties and yielding dressings with antimicrobial, antioxidant, and analgesic qualities.

An extensive characterization of the dressings was conducted. Scanning electron microscopy (SEM) analysis revealed uniform, porous, and fine mesh structures across all PPP-based samples. Attenuated total reflectance Fourier-transform infrared spectroscopy (ATR-FTIR) confirmed the successful integration of essential oils as bioactive agents in PPP/EUD samples, while X-ray diffraction (XRD) results highlighted the retention of PPP's amorphous features, ensuring high solubility and enhanced bioavailability. Thermal analysis demonstrated improved stability in PPP/EUD+EO samples. Water contact angle and swelling tests showcased the dressings' hydrophilic nature, with pure PPP/EUD achieving complete wettability (0°) and EO-infused groups displaying moderate hydrophilicity (50°–68°). EO-free PPP samples exhibited the highest swelling rate (61.63% after 24 hours), while EO-infused samples demonstrated sustained absorption capabilities. Biological evaluations further underscored the therapeutic potential of these dressings. PPP/EUD+MPEO displayed superior antioxidant activity, reaching optimal 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging values within 15 minutes. Antibacterial testing revealed remarkable efficacy, with PPP/EUD+ROEO achieving an inhibition rate of ~83% against *Staphylococcus aureus* and PPP/EUD+MPEO demonstrating the highest inhibition (~88%) against *Escherichia coli*.

This research highlights the valorization of Moroccan fruit-waste, such as pomegranate peel as a sustainable and functional biopolymer, offering a unique combination of printability and high therapeutic performance. The incorporation of MPEO and ROEO significantly enhances the antibacterial, antioxidant, and physicochemical properties of the 3D-printed dressings, positioning PPP/EUD+EO formulations as a promising innovation for advanced wound healing applications.

Keywords: 3D Printing, Biopolymers, Bio-waste Valorization, Essential Oils, Antimicrobial Activity, Wound Healing, Personalized Medicine.

90. **Optimizing the performance of photovoltaic systems using the Artificial Bee Colony (ABC) Algorithm

Hajar Zerriq

Sidi Mohamed Ben Abdellah University , L'École normale supérieure (ENS), Morocco

In several nations, photovoltaic (PV) power systems are widely employed. However, several urgent challenges must be addressed to ensure their effective deployment. One of the main issues is improving their efficiency. Consequently, tracking this aspect is essential to optimize the energy production of PV systems. In this regard, we propose a system consisting of a photovoltaic generator and a boost converter (DC/DC) controlled by a maximum power point tracking (MPPT) algorithm. The objective of our system is to ensure maximum power operation of the PV system under various environmental conditions, such as temperature and solar irradiation. To achieve this, the Artificial Bee Colony (ABC) method was implemented and compared to another MPPT method: Perturbation and Observation (P&O), to evaluate the best and most accurate controller under different weather conditions. The methodology used is quasi-experimental, based on simulation with Matlab/Simulink. The results show that the ABC method offers an accuracy of 99.83%, which is superior to the P&O method, which achieves 99.23%. In terms of response time, the ABC method is slightly slower than P&O, with response times of 0.00589 s and 0.00585 s, respectively. However, the P&O method exhibits excessive fluctuations, thereby reducing its stability compared to ABC. These results indicate that the ABC method stands out for its high precision and stability, despite a slightly longer response time, making it a better option for precise and stable maximum power point tracking.

Keywords: MPPT, Perturbation et Observation (P&O), Colonie d'Abeilles Artificielles (ABC), simulation, Matlab/Simulink, PV system.

91. DFT-Guided Design of MgZnAl-LTH/Activated Carbon Composites for Efficient Dual Dye Removal in Wastewater Treatment

Chaymae Hmimen[1], Alae Elabed[1], Saber Boubakri[2], Mohamed Amine Djebbi[2], Abdesslem Ben Haj Amara[2], Saad Ibn Souda Koraichi[1], and Soumya Elabed[1]

1 Laboratory of Microbial Biotechnology and Bioactive Molecules, Faculty of Sciences and Technology, Sidi Mohamed Ben Abdellah University, Fez, Morocco

2 Laboratory of Ressources, Materials & Ecosystem (RME), University of Carthage, Faculty of Sciences of Bizerte, Zarzouna, 7021, Tunisia

Industrial wastewater contaminated with toxic dyes like methyl orange (MO) and methylene blue (MB) poses serious environmental risks. Developing efficient adsorbents capable of removing both anionic and cationic dyes is therefore essential. This study proposes a hybrid adsorbent combining MgZnAl-layered triple hydroxide (LTH) and activated carbon (AC) derived from argan nutshells, designed to enhance dye removal from aqueous solutions.
The LTH_AC composites were synthesized via coprecipitation, carbonization, and H_3PO_4 activation, and then thoroughly characterized using XRD, FTIR, Raman spectroscopy, BET, SEM, and TEM. The optimized LTH_AC500 composite demonstrated excellent adsorption capacities, reaching 154.219 mg/g for MO and 112.989 mg/g for MB. Kinetic analysis followed a pseudo-second-order model, confirming a chemisorption-dominated process, while the Freundlich isotherm model suggested multilayer adsorption on a heterogeneous surface.

Thermodynamic studies revealed that MO adsorption is endothermic, whereas MB adsorption is exothermic, both occurring spontaneously. DFT calculations provided molecular-level insights into the adsorption mechanisms, highlighting π-π stacking, coordination interactions, anion exchange, and charge transfer between the dyes and the composite. Additionally, experimental results confirmed the composite's high stability, recyclability over five cycles, and resistance to interference from competing ions, establishing it as a promising material for sustainable dye removal in wastewater treatment.

Keywords: Layered triple hydroxide (LTH), Activated carbon (AC), Dye adsorption, DFT calculation, Adsorption mechanisms.

92. Synthesis, Characterization, and Biological Evaluation of Alkyl Thiazole Derivatives: Reactivity Studies and Assessment of Antimicrobial and Antioxidant Activities

Houda Serrar[1,2], Asmae Qaliha[2], Said Boukhris[2], Amina Hassikou[3], Mohammed lachkar[1], and Abdelaziz Souizi[2]

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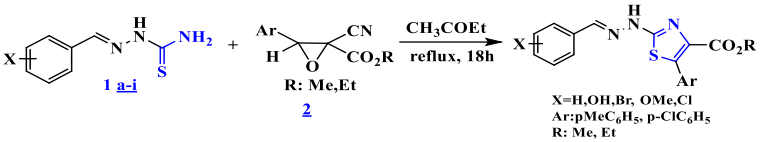
3 Community for Open Antimicrobial Drug Discovery, Institute for Molecular Bioscience, The University of Queensland, Brisbane, Queensland 4072, Australia

In this research, we explored the reactivity of gemcyanester 2 epoxides with substituted thiosemicarbazides **1a-i**. The reaction was carried out via reflux in ethyl acetate for 18 hours, resulting in the formation of alkyl 2-(2-(arylidene)hydrazinyl)-5-(aryl)thiazole-4-carboxylates **3 a-i**. The chemical structures of these compounds were determined using various spectroscopic techniques such as IR, 1H NMR, 13C NMR, and mass spectrometry (Scheme 1). Subsequently, the synthesized compounds underwent biological evaluation, with a specific focus on their antimicrobial and antioxidant properties.



Scheme1: Synthesis reaction of new alkyl 2-(2-(arylidene)hydrazinyl)-5-(aryl)thiazole-4-carboxylates **3 a-i**

The subsequent phase of this investigation concentrated on assessing the biological activities, particularly antimicrobial and antioxidant properties, given the significance of heterocyclic chemistry in this context. The synthesized compounds exhibited antimicrobial activity against five bacterial strains (Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Acinetobacter baumannii, and Pseudomonas aeruginosa) and were also tested for antifungal activity against two Candida species: Candida albicans and Cryptococcus neoformans var grubii. Furthermore, the antioxidant potential of these novel heterocyclic products was evaluated using three distinct methods: FRAP (Ferric Reducing Antioxidant Power), H_2O_2 scavenging assay, and phosphomolybdenum assay.

Keywords: Synthesis, alkyl thiazole derivatives, antimicrobial and antioxidant activities

93. Integrated Remote Sensing and Geophysical Approaches for Enhanced Detection of Copper, Iron, and Manganese Anomalies in Southern Morocco

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The accurate detection of copper, iron, and manganese mineralization is essential for effective resource exploration and management. This study combines remote sensing and geophysical techniques to improve the identification and mapping of mineral anomalies in the Ouarzazate region, southern Morocco. Sentinel-2 and ASTER imagery were processed to extract relevant mineral indices, focusing on spectral signatures indicative of copper, iron, and manganese. Advanced normalization and visualization methods were applied to highlight and delineate zones of significant mineral anomalies.
To validate and enhance the accuracy of the remote sensing results, magnetic geophysical surveys were employed to provide complementary subsurface data. These geophysical analyses revealed structural features that correlated strongly with surface anomalies detected via remote sensing. Field investigations further verified the presence of copper, iron, and manganese mineralization in key locations, corroborating the results obtained through the integrated approach. The findings demonstrate that this methodology provides a robust framework for multi-mineral exploration by reducing uncertainties and increasing reliability. This integrative approach establishes a benchmark for the application of remote sensing, geophysical surveys, and field validation in complex geological terrains.

Keywords: Copper, iron, manganese, remote sensing, geophysics, Ouarzazate.

94. Unleashing the Full Potential of Chitosan@EDTA Beads for High-Performance Cu2+ Ion Adsorption: A Comprehensive Fusion of Experimental Mechanisms, Response Surface Optimization, and Advanced Theoretical Modeling

Soukaina El Bourachdi[1], Fatima Moussaoui[1], Ali raza Ayub[2], Abdelhay El Amri[3], and Amal Lahkimi[1]

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2 Key Laboratory of Clusters Science of Ministry of Education, School of Chemistry and Chemical Engineering, Beijing Institute of Technology, Beijing, 100081, P. R. China.

3 Laboratory of Advanced Materials and Process Engineering (LAMPE), Faculty of Sciences, Ibn Tofaïl University, B.P. 133, 14000 Kenitra, Morocco.

Copper ions (Cu^{2+}) in water present serious environmental and health concerns due to their toxicity and persistence, affecting both human health and aquatic ecosystems. This study addresses the challenge of Cu^{2+} removal by synthesizing and characterizing a novel composite material based on chitosan. The composite was analyzed using X-ray diffraction (XRD), scanning electron microscopy (SEM), and infrared spectroscopy (IR), with SEM confirming Cu^{2+} uptake after adsorption. The adsorption process was exothermic, indicating heat release, and led to increased disorder at the solid-liquid interface as Cu^{2+} ions interacted with the adsorbent. The process was spontaneous, as demonstrated by negative Gibbs free energy values across different temperatures. A Box-Behnken Design (BBD) within Response Surface Methodology (RSM) was employed to optimize conditions, investigating the influence of pH, composite mass, and Cu^{2+} concentration. Density Functional Theory (DFT) analysis was used to delve deeper into the interaction mechanisms between Cu^{2+} and the composite, highlighting the role of functional groups in enabling strong electrostatic interactions for effective Cu^{2+} adsorption.

Keywords: Adsorption, Box-Behnken Design, Chitosan-based composite, Cu^{2+} removal, Density Functional Theory, Response Surface Methodology.

PHYSICAL AND LIFE SCIENCES ORAL PRESENTATIONS SESSION 1

1:00 pm – 3:00 pm

Zoom Link

Moderators: Ethan Birney and Rob Riser

*Undergraduate Presentations **Graduate Presentations

95. *Enhancing Energy Efficiency in Phosphoric Acid Concentration: Analyzing the Impact of Parameters in Microwave Technology

Rachid Bagoun[1,2], Mohamed El Khouakhi[2], Omari Lhoussaine[3], and Mohammed EL Asri[1,2]

1 Laboratory of Applied Organic Chemistry, Faculty of Science and Techniques, University of Sidi Mohamed Ben Adbellah,
2 Technology Development Cell (TechCell), Mohammed VI Polytechnic University (UM6P), Benguerir Morocco,
3 OCP Group, BP 118, Jorf Lasfar, El Jadida, Morocco

The concentration of phosphoric acid through microwave irradiation under vacuum conditions successfully achieved the desired P_2O_5 levels in the final concentrate. This achievement was significantly influenced by factors such as irradiation time, sample volume, operating vacuum pressure, thermal insulation, and reactor geometry. The experimental design allowed us to investigate these variables, revealing their substantial effects on energy efficiency and the P_2O_5 concentration (wt%). Notably, reactor geometry emerged as a critical factor due to its impact on the sample's surface area-to-volume ratio, which strongly affects energy efficiency.

Keywords: Enrichment phosphoric acid concentration, Phosphoric acid 27% wt P_2O_5, Phosphoric acid 54%wt P_2O_5, Energy efficiency, Microwave heating.

96. **Corrosion Inhibition of Mild Steel in Hydrochloric Acid Solution by Benzimidazole: Experimental and Theoretical Studies

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1 Laboratory of Engineering, Electrochemistry, Modeling and Environment, Faculty of Sciences, Sidi Mohamed Ben Abdellah University, Fez, Morocco.

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In this article, two compounds, P1 and P2, are studied as corrosion inhibitors for mild steel in an acid solution (1M HCl). Inhibitory performance is evaluated using experimental (potentiodynamic polarization and electrochemical impedance spectroscopy) and theoretical (DFT calculations and molecular dynamics simulations) techniques. Both compounds act as mixed inhibitors, simultaneously reducing anodic and cathodic reactions. Stable chemical adsorption to the metal surface is confirmed by the Langmuir isotherm and theoretical calculations, which demonstrate significant charge transfer and coordination bond formation. P1 and P2 show high corrosion inhibition rates, although P1 performs slightly better in terms of stability and interaction with the metal surface.Details of Theoretical Calculations The Langmuir isotherm reveals that adsorption of both compounds is chemical and stable, with negative values for the free energy of adsorption for P1 and P2 indicating a spontaneous and thermodynamically favorable process. Scanning electron microscopy (SEM) analysis shows that the metal surface remains smooth and protected in the presence of the inhibitors, in contrast to a highly corroded surface without them. In conclusion, compounds P1 and P2 demonstrate remarkable effectiveness as corrosion inhibitors, with P1 performing slightly better, thanks to its stability and strong interaction with the metal surface.

Keywords: Corrosion inhibition, electrochemical techniques, DFT, MC simulations, MEB-EDX

97. **Technological and Antimicrobial Properties of Isolated Lactic Acid Bacteria Strains with Antagonistic Activity Against Listeria Monocytogenes

Imane Maiouet, Kaoutar El Mahi, Houssam Abouloifa, and Naima Rhallabi

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The growing concern over foodborne pathogens has increased interest in using lactic acid bacteria (LAB) as bioprotective agents in food preservation. This study investigates the technological and antimicrobial properties of LAB strains isolated from cow, ewe, goat, and camel milk. The primary aim was to explore the potential of these strains to inhibit the growth of foodborne pathogens and assess their suitability for use in food safety applications.

In this study, LAB strains were isolated from various animal milks and tested for their antimicrobial activity against a range of foodborne pathogens, including *Listeria monocytogenes, Escherichia coli, Bacillus cereus, Staphylococcus aureus,* and *Rhodotorula*, using agar diffusion assays. The antimicrobial testing revealed significant inhibitory effects, suggesting that these LAB strains could serve as effective bioprotective agents in food preservation. Additionally, several technological characteristics of the LAB strains were evaluated. These included their ability to produce lactic acid and exopolysaccharides, as well as enzymatic activities such as protease, amylase, and cellulase. The strains were also tested for their tolerance to varying temperatures, pH levels, and NaCl concentrations, providing insight into their potential for use in diverse food environments.

The results indicated that the LAB strains exhibited strong growth and high tolerance to a wide range of environmental conditions, making them promising candidates for use in fermented food products. These findings contribute to the growing body of knowledge on the use of LAB for food preservation, highlighting the potential of strains isolated from animal milks to improve food safety and quality. This study suggests that LAB strains with antimicrobial and technological properties could be utilized as functional starters and bioprotective agents in the food industry, offering an effective strategy for controlling foodborne pathogens and enhancing food shelf life.

Keywords: Lactic acid bacteria (LAB), Antimicrobial activity, Foodborne pathogens, Bioprotective agents, Technological properties, Food preservation.

98. **Comparative Study of Titanate-Based Perovskite Oxides for Energy Storage Devices

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Titanium-based perovskite oxides were formed by sol-gel process using metal nitrates and titanium isopropoxide as starting materials. In this work, a comparison between the structural, chemical, optical, morphological, dielectric and electrochemical properties of various titanate-based perovskite oxides such as barium, strontium and calcium titanate is done. XRD confirmed the formation of perovskite structure in all the titanates. FTIR analysis and SEM are used to find the functional group and morphology of the samples, respectively. Uv-visible spectroscopy revealed that $CaTiO_3$ has the highest bandgap of 3.51 eV, which decreased sequentially in $SrTiO_3$ (3.24 eV) and $BaTiO_3$ (3.20 eV). Dielectric studies showed that $BaTiO_3$ has the highest dielectric constant of 1211 at room temperature, while $SrTiO_3$ and $CaTiO_3$ showed a lower value of 240 and 190, respectively, at the same frequency. The electrochemical studies of the prepared nanocomposites were assessed by cyclic voltammetry, galvanostatic charge-discharge and electrochemical impedance spectroscopy. In comparison to $SrTiO_3$ and $CaTiO_3$, which exhibit a specific capacitance of 251 and 165 Fg^{-1}, $BaTiO_3$ exhibits a high specific capacitance of 436 Fg^{-1} at the scan rate of 1 mVs^{-1}. Also, the highest energy density of 16.76 $Whkg^{-1}$ for $BaTiO_3$ is recorded from galvanometric charge-discharge measurements. In addition, the prepared electrode serves as a better environmentally friendly candidate with comparatively high specific capacitance and energy density compared to lead-based oxides already used in the market for energy-related applications.

Keywords: Titanium-based perovskite oxides, sol-gel method, dielectric constant, specific capacitance.

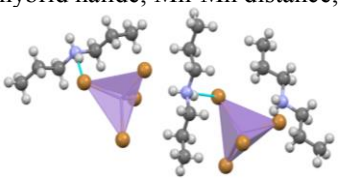
99. **(DPA)2MnBr4: an environmentally friendly organic-inorganic hybrid metal halide perovskite with highly efficient green emission and high performance for green down-converted LEDs

Asmae Ben Abdelhadi, Mario Gutiérrez, Luis Lezama, Boiko Cohen, Rachid Ouarsal, Mohammed Lachkar and Abderrazzak Douhal

University Sidi Mohamed Ben Abdellah, Faculty of Sciences, Morocco

To solve the toxicity and instability problems of the light emissive three-dimensional lead halide perovskite, zero-dimensional (0D) lead-free hybrid manganese halides with low cost and high emission efficiency have become one of the most promising solid-state lights emitting materials owing to their excellent optical properties. In this work, by utilizing discrete $[MnBr_4]^{2-}$ tetrahedrons as the optical center, we successfully prepare a novel manganese-based lead-free zero-dimensional $(DPA)_2MnBr_4$ (DPA: di-n-propylammonium) single crystals with green emission, employing a slow evaporation method. Single-crystal X-ray diffraction reveals a 0D-dimensional structure consisting of an independent inorganic sheet of tetrahedral units $[MnBr_4]^{2-}$ separated by isolated di-n-propylammonium organic cations. Thermal analysis indicates that the hybrid perovskite is highly thermally stable, decomposing in two main steps. In addition, EPR experiments confirm the tetrahedral environments of Mn^{2+} cations. The as-synthesized **1** features high luminescent efficiency and strong green emissions at 537 nm with an impressive photoluminescence quantum yield (PLQY) of approximately 50% and long-lifetime emission of 0.328ms, benefiting from the lowest d−d orbital transition of Mn^{2+} ion in the tetrahedral crystal field and the considerable Mn–Mn spacing distance between adjacent $[MnBr_4]^{2-}$ tetrahedra. More importantly, the as-prepared Mn-based halide perovskite was employed as emitters in fabricating down-conversion green-light-emitting diodes (LEDs) with high color quality by combining them with commercialized blue phosphor. Finally, the potential for detecting polar solvent vapors is presented.

Keywords: Mn-based halide perovskites; low dimensional; single crystal; hybrid halide; Mn-Mn distance; green-light-emitting diodes.



Scheme 1. Crystal structure of $(DPA)_2MnBr_4$ in the asymmetric part of the unit cell, the cyan dashed line showed the H-bonds between di-n-propylammonium organic cations and $[MnBr_4]^{2-}$tetrahedral units.

100.**Parametric optimization of catalytic deconstruction of plastic waste using Al_2O_3 supported NiO, CuO, ZnO catalysts

Alisha Ijaz, M. Yasin Naz, and Abdul Ghaffar

Department of Physics, University of Agriculture, Faisalabad.

Yearly plastic waste disposals amounting to millions of tons end up in landfills and ecosystems thus creating an urgent global-scale pollution crisis. Catalytic microwave pyrolysis of high density polyethylene (HDPE) is an effective way of recycling waste in the context of sustainable waste management and energy recovery. In this study, the catalytic pyrolysis of HDPE has been optimized by using Al_2O_3 supported NiO, CuO and ZnO catalysts, which is based on Response Surface Methodology (RSM) by using Box Behnken Design (BBD). A 1 kW microwave pyrolysis system treated 40g of HDPE between 250-450°C to produce liquid fuel combined with syngas and char products. CuO (40 g) gave the highest oil yield of 73% and NiO showed the highest gas fraction of 25 %. XRD analysis showed that the char generated by NiO was the most crystalline (23.11 nm, $2\theta = 36.15°$). SEM images showed that NiO, which enhanced the highest particle fragmentation of 16.24 µm, and ZnO solid made particles of 22.60 µm. FTIR confirmed the presence of C^{13+} alkanes, alkenes and aromatics, indicating that the liquid product may serve as a fuel precursor. The highest hydrogen selectivity was attained through Al_2O_3 with a selectivity of 85.6%, whereby the syngas contained hydrogen (84.9 vol. %), methane (4.1%), and CO_2 (3.8%). The microwave pyrolysis technology proves effective in plastic waste management because it creates hydrogen products as well as renewable carbon-based fuels. This content gives the possibility for renewable energy and for circular economy strategies, and for industrial applications at scale.

101.**Sequential Treatment of Young Landfill Leachate Using Aeration and UV/US/Activated Persulfate-Hydrogen Peroxide: Performance Assessment, Optimization, and Phytotoxicity Analysis

H. Bellouk[1], I. Zouitane[2], I. El Mrabet[1,3], N. El Ghachtouli[2], K. Tanji[1,4], F. Khalil[1], and H. Zaitan[1]

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A comprehensive treatment strategy was developed to manage young landfill leachate (YLL) from Fez City, utilizing a sequential system combining aeration as pretreatment and an advanced oxidation process (AOP) with hydrogen peroxide (HP) and persulfate (PS) as oxidants. The AOP was activated through UV-A irradiation and ultrasound (US) (HP-PS-US-UV-A).Aeration pretreatment achieved pollutant removal efficiencies of 54% for chemical oxygen demand (COD), 61% for color, and 55% for Abs254. Following aeration, the AOP's performance was optimized using the Box-Behnken Design (BBD), which analyzed the effects of pH, persulfate concentration, and hydrogen peroxide concentration on removal efficiencies. The optimized system demonstrated exceptional pollutant reduction, achieving 89% COD removal, 99% color removal, and 96% Abs254 removal.Microbiological analyses highlighted the complete elimination of total coliforms, fecal coliforms, and mesophilic bacteria through this sequential approach. Additionally, phytotoxicity was evaluated using Medicago sativa (alfalfa) bioindicators, such as seed germination and root elongation. Treated leachate showed a significant reduction in phytotoxicity compared to untreated samples, indicating improved safety for potential reuse.The treated effluent met environmental standards, demonstrating suitability for reuse in industrial processes or agricultural irrigation. This innovative sequential treatment not only offers efficient YLL management but also promotes sustainability by enabling leachate reuse. The findings contribute to advancing environmental management strategies and align with global efforts to support circular economy principles

Keywords: Advanced Oxidation Process; Aeration; Box-Behnken Design; Leachate; Ultrasound; Ultraviolet irradiation.

102.**Antioxidant, Analgesic, and Wound-Healing Effects of Pine Needles: A Natural Approach to Pain and Oxidative Stress Management

Widad Tbatou[1,2], Beybeti Ishagh[1], Hassan Laaroussi[1], Karima ElYagoubi[1], Bruno Eto[2], Badiaa Lyoussi[1], and Zineb Benziane Ouaritini[1]

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2 Laboratories TBC, Laboratory of Pharmacology, Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Lille, 3, rue du Professeur Laguesse, B.P. 83, F-59000 Lille, France.

Oxidative stress occurs when there is an imbalance between the production of reactive oxygen species (ROS) and the body's antioxidant defenses. This imbalance can lead to various pain-related symptoms and the persistence of pain. Burns, which cause severe tissue damage, are among the most painful situations and are associated with oxidative stress and ongoing inflammation. Therefore, identifying a natural product that possesses analgesic, antioxidant and wound-healing properties could provide a promising alternative for pain management. Pine needles have been widely used in traditional medicine to treat a wide range of diseases such as bronchitis, pneumonia, respiratory infections, and colds. Additionally, they are utilized for treating wounds, inflammation, urinary problems, and gastric and intestinal ulcers. This current investigation aims to explore and demonstrate the antioxidant, analgesic, and wound-healing effect of two species of pine trees (*Pinus pinaster* (PPN), and *Pinus Halepensis* (PAN)) extract. The phytochemical analysis revealed a high phenolic content of PAN extract with a TPC level of 81.97 ± 0.39 mg GAE/g DM, TFC: 18.76 ± 0.03 mg QE/g DM. The extract had significant antioxidant activity (DPPH-IC_{50}: 47.36 ± 0.12 µg/ ml, TAC: 444.81 ± 5.60 mg EAA/g DM), while the *in vivo* activities (analgesic, and wound healing potential) indicated the excellent activity of the *Pinus halepensis* needles extract (PAN). These findings support the therapeutic use of this plant by-product in preventing pain and promoting wound healing. Further studies are needed to uncover, identify, and isolate compounds of potential medicinal and therapeutic significance in this species.

Keywords: Pine needles, antioxidant effect, analgesic, wound-healing, therapeutic use, phenolic content, *in vivo* activities.

103.**Anthropogenic Factors Affecting the Siltation of the Tildi hill dam in Morocco

Asma Id Babou and Anouar Alami

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The siltation of hill dams is a major challenge that affects water storage capacity and the sustainability of infrastructure. This study examines the impact of anthropogenic factors on the siltation of the Tildi hill dam in the Agadir region of Morocco. Using a combination of field observations, sediment analyses, and historical data, the research highlights the role of deforestation, overgrazing, and land-use changes in accelerating sediment deposition in hill dams. The results of our study reveal that human activities significantly contribute to the reduction of the storage capacity of hill dams, impacting their utility, particularly for water supply and irrigation. The study suggests preventive measures against siltation, including reforestation, erosion control strategies, and improved watershed management, to mitigate sedimentation and extend the operational lifespan of hill dams.

Keywords: Siltation, Dam, Anthropogenic Factors.

PHYSICAL AND LIFE SCIENCES ORAL PRESENTATIONS SESSION 2

1:00 pm – 3:00 pm

Zoom Link

Moderators: Kirstan Cunningham and Anouar Alami

104. Pretreatment-Enhanced Microbial Electrolysis of Shrimp Waste: A Strategy for Simultaneous Energy and High-value Product Recovery

Fatima Zehra Ben Tarraf

Faculté des Sciences et Techniques de Fès, Morocco

Microbial electrolysis offers a sustainable pathway to energy production by harnessing the metabolic power of exoelectrogenic microorganisms to convert organic matter. However, the presence of recalcitrant compounds in organic waste often hinders exoelectrogenic activity and limits biohydrogen production. This study focuses on shrimp waste, a globally abundant byproduct of the shrimp processing industry (approximately 3.8 million tons annually), as a promising substrate for microbial electrolysis. Shrimp waste, particularly its exoskeleton, is a complex matrix rich in bioactive components, especially proteins (20–50%). To enhance energy conversion, this study employs a deproteinization strategy. Raw and deproteinized shrimp waste were compared as substrates in a single-chamber microbial electrolysis cell (MEC), operated at an applied voltage of -0.2 V vs. Saturated Calomel Electrode (SCE).

Electrochemical analyses including chronoamperometry and cyclic voltammetry were performed using a BioLogic potentiostat, to quantify the current density generated and predict hydrogen production. Results showed that after 15 days, the deproteinized waste-fed MEC achieved a current density of 7.51 ± 1.24 A/m², significantly higher than the 3.49 ± 0.64 A/m² observed in acetate-fed MEC. The predicted hydrogen volume from the deproteinized waste (0.4 L) was over five times greater than that from acetate (0.07 L). Furthermore, the deproteinized waste demonstrated both higher current generation and a more sustained performance (45 days) compared to acetate (25 days). Conversely, raw waste exhibited poor performance (0.24 ± 0.04 A/m² and 0.01 L of H2) likely due to its limited biodegradability or the presence of some compounds that inhibit exoelectrogenic activity. These results confirm that the applied pretreatment effectively enhanced energy recovery from shrimp waste through microbial electrolysis, maximizing not only energy production but also allowing the recovery of protein.

105. Biological Control of Penicillium Digitatum And Penicillium Italicum on Postharvest citrus fruits

H. Benzahra[1,2], I. Mrabti[1,2], H. Grijja[1], S. Ait Baddou[1,2], K. Selmaoui[1] , and M. Afechtal[1]

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2 Laboratory of Plant, Animal, and Agro-Industry Productions, Faculty of Sciences, University Ibn Toufail, Kenitra, Morocco.

Green mold (Penicillium digitatum) and blue mold (Penicillium italicum) are two of the most economically significant post-harvest diseases affecting citrus fruit worldwide.. The widespread economic losses in citriculture caused by these phytopathogens are minimized with the use of synthetic fungicides such as imazalil, thiabendazole, pyrimethanil, and fludioxonil, which are mainly employed as control agents and may have harmful effects on human health and environment. So far, many non-chemical post-harvest treatments have been investigated for the control of these pathogens.

Biological control of Penicillium in citrus has shown promising results using various antagonistic microorganisms. Bacillus pumilus demonstrated significant control of P. digitatum on oranges and lemons, comparable to chemical fungicides. Yeasts like Debaryomyces hansenii and bacteria such as Pseudomonas cepacia exhibited effective antagonism against P. digitatum and P. italicum. Pseudomonas fluorescens significantly inhibited P. digitatum growth on oranges, both in vitro and in vivo. The fungus Trichoderma viride increased orange resistance to P. digitatum when applied preventatively. These studies demonstrate that various microorganisms can effectively control Penicillium in citrus fruits, offering potential alternatives to chemical fungicides. The efficacy of biological control agents depends on factors such as concentration, timing of application, and specific antagonist-pathogen interactions.

Keywords: citrus, Penicillium digitatum, Penicillium italicum, post-harvest disease, biological control.

106. The Crucial Roles of Phloem Companion Cells in Response to Phosphorus Deficiency

Cankui Zhang

Purdue University, USA

Mineral deficiency is a major problem in agriculture. Plant adaption to low mineral environments involves signaling between shoots and roots, via the food transport cells, the sieve elements. However, due to the sequestered position of the sieve elements in the vascular bundles, identifying shoot-to-root mobile signals is challenging. In herbaceous species, sieve elements and companion cells (CCs) are isolated from other leaf tissues. We hypothesize that phloem CCs play an essential role by synthesizing shoot-to-root signals in response to mineral deficiency. To test this hypothesis, we analyzed gene expression responses in Arabidopsis CCs under phosphorus deficiency using TRAP-Seq. Phosphorus was chosen for its importance in plant growth and the known role of shoot-to-root signaling in regulating root phosphate transporters during deficiency. Our findings revealed that CCs exhibit more dramatic molecular responses than other leaf cells. We also found that many genes altered in CCs have potential functions in regulating root growth. This is unexpected because it has been widely believed that shoot-to-root signaling is not involved in root growth regulation under P deficiency. The importance of CCs in regulating mineral deficiency may extend beyond phosphorus because shoot-to-root signaling is a common response to the deficiency of various minerals.

107. Comparative Study of Ten DNA Extraction Methods for Three major scale insects infecting citrus trees in Morocco

I. Mrabti[1,2], H. Grijja[1,3], H. Benzahra[1,2], N. Brhadda[2], R. Ziri[2], and M. Afechtal[1]

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3 Laboratory of Entomology, Regional Center of Agricultural Research of Kenitra, National Institute of Agricultural Research, 14000 Kenitra Morocco.

Traditionally, insect identification relies on morphological methods, but these approaches have limitations, particularly due to the similarities between certain species. To address these challenges, molecular techniques, such as DNA barcoding, have become crucial for improving pest identification and management. The quality of the extracted DNA is essential in these methods, as it directly impacts the accuracy and reliability of the results.
Extracting DNA from scale insects is particularly challenging due to their small size and waxy coating. In this context, a study was conducted between the summer and autumn of 2024 in north-western Morocco to assess the effectiveness of ten DNA extraction methods on scale insects. The three target species – *Aonidiella aurantii*, *Protopulvinaria pyriformis* and *Icerya purchasi* – are significant pests of citrus crops in Morocco. The main goal of this research was to evaluate DNA extraction methods that are fast, cost-effective, and environmentally friendly. The results showed that fresh samples of *Protopulvinaria pyriformis* yielded the most effective DNA extraction. Among the methods tested, NaCl (5M) provided the highest DNA yield, while the KAc (Potassium Acetate) and SDS (Sodium Dodecyl Sulfate) methods resulted in average yields, all while being cost-efficient and environmentally sustainable. The findings of this study offer valuable guidance for selecting an optimal DNA extraction method for scale insects. These recommendations can help enhance the identification and management of these pests, thereby improving pest control and monitoring strategies in agricultural settings.

Keywords : *Aonidiella aurantii*, *Protopulvinaria pyriformis, Icerya purchasi*, DNA extraction, citrus, Morocco.

108. Research Activities and Opportunities in Food and Nutrition Sciences at The University of Alabama

Lingyan Kong

Department of Human Nutrition, Hospitality and Sport Management, The University of Alabama, USA

In this talk, the speaker will share information about research activities, achievements, Master's and PhD programs, and exciting research opportunities in food and nutrition sciences for undergraduate and graduate students at The University of Alabama. The Department of Human Nutrition has a total of ten research faculty members who are active in food and nutrition research and education. Both the MS and PhD programs focus on translational nutrition, training students in bench-to-bedside-to-community research. Various types of financial support, including Graduate Research Assistantships, Teaching Assistantships, and Fellowships, are available on a competitive basis. Starting in 2025, the Department of Human Nutrition will launch a summer Research Experience for Undergraduates (REU) program. Selected undergraduate fellows will have the opportunity to join research projects of their choice while receiving a generous stipend, as well as lodging, meal, and travel support. Additionally, on April 11, 2025, the department will host its inaugural Nutrition Research Symposium, inviting students, researchers, and professors to attend and present their research.

March 12, 2025
In-Person Event

10:00 am – 12:30 pm

*Undergraduate Presentations **Graduate Presentations

Education

109.**ASGC Programs and Students' Hands-On STEAM Education

Yire Seo, Yeeun Kang, Minha Kim, Hyeeun Ko, and Hayoon Park

Dept. of Teaching, Learning, Leadership, University of North Alabama. 1 Harrison Plaza, Florence, AL 35632

Building on the outreach experience of the Alabama Space Grant Consortium (ASGC), this research investigates the integration of NASA's Mars exploration technology into STEAM education through the use of coding and robotics in secondary school environments. The primary objective was to enhance student engagement, computational thinking, and problem-solving abilities while simultaneously cultivating interest in STEAM disciplines. By utilizing space exploration as a compelling context, the curriculum was designed to accommodate diverse learners, employing principles of Universal Design for Learning (UDL) and Concrete-Representational-Abstract (CRA) Scaffolding. Students participated in task-based learning, progressively acquiring skills necessary to formulate fully functional algorithms that govern robotic movements in game-based challenges. The study adheres to NASA Education's strategic framework, which emphasizes the phases of Inspire, Engage, Educate, and Employ. It included comprehensive lesson designs that were aligned with educational theories, ensuring that students acquired vital STEAM competencies through hands-on experiential learning. The mission of NASA and the significance of space exploration to STEAM were integral to the curriculum, thereby contributing to workforce development, K-12 educational objectives, and the promotion of NASA's mission and sustainability initiatives. Preliminary findings suggest that students developed essential problem-solving, creativity, and collaboration skills, in alignment with Sustainable Development Goal (SDG) 4, which emphasizes inclusive and equitable quality education. The project also underscored the application of UDL to address diverse learning needs, thereby ensuring accessibility and engagement for all students. The CRA scaffolding approach effectively facilitated students' progression from concrete manipulation to abstract reasoning, thereby reinforcing their conceptual understanding. In summary, this project underscores the potential of integrating NASA's technology into educational practices to nurture future STEAM talent. By fostering collaboration between higher education institutions and local schools, the initiative ensured instructional relevance and long-term impact, contributing to a more inclusive, inquiry-driven, and workforce-aligned STEAM education framework.

Keywords: STEAM Education, Coding and Robotics, Alabama Space Grant Consortium (ASGC), Universal Design for Learning (UDL), Concrete-Representational-Abstract (CRA)

Engineering and Computer Science

110.*Graphene Remediation of Diethyl Phthalate (DEP): A Comparison

Christian Colato[1] and Christopher S. Griggs[2]

1 Department of Biological and Environmental Science, University of West Alabama, Livingston, AL, 35470 USA

2 Environmental Engineering Branch, U.S. Army ERDC Vicksburg, MS

The transport of water to military installations is a high-cost export that is a necessity for drinking, bathing, and equipment cleaning. Water filtration to create a necessary reuse of clean water is ideal for cost efficiency and sustainability. Graphene is a novel adsorbent for emerging contaminants such as personal care and pharmaceutical products that have impacts on water quality. Water quality is critical in austere environments like the desert or arctic where soldiers need water resources. One pollutant that has been found in water, post-soldier exposure, is diethyl phthalate (DEP). We compared graphene that was produced in NATO partner countries to graphene that is domestically produced to determine the water absorption of novel contaminants. We compared graphene nanoplatelets (GnP), Fractal Graphene (FG), and Reactive Graphene (RG) to the more traditional filtration absorbent, granular activated carbon (GAC). Our results show a significantly faster kinetic adsorption of DEP when treated with GnP than when compared to FG, RG, and GAC. This preliminary study could lead to military application that could in term be used for domestic civilian use of removing contaminants from wastewater.

Keywords: graphene, granular-activated-carbon, contaminants, military, adsorption00

Health and Medicine

111.*Classical Conditioning With A Natural Stimulant In Anolis carolinensis (Green Anole)

Christian Colato and Wayne Korzan

Department of Biological and Environmental Science, University of West Alabama, Livingston, AL, 35470 USA

The dewlap extension in *Anolis carolinensis* (Green Anole) plays a key role in territorial signaling, with its physical movement and color indicating male territorial behavior. Understanding visual signals in this species is important, as *A. carolinensis* serves as a model for studying evolution, stress, aggression, and reproduction in reptiles. (Summers 1995; Korzan 2000; Losos 2009). Although research on social behavior and visual signals is extensive, little is known about whether *A. carolinensis* can be classically conditioned through visual signals to display repetitive behaviors. We aim to explore this by testing if pairing a visual signal with a natural stimulant, such as nicotine via digestion with nicotine dosed crickets, increases locomotor activity. Three groups will be tested: Group A, a control group without nicotine; Group B, a group with low nicotine-dosed crickets; Group C, a group with high nicotine-dosed crickets. We hypothesize that combining nicotine and light signals will lead to classical conditioning in *A. carolinensis.* All results will prove novel data for better understanding visual stimulant attentiveness in lower vertebrates.

Keywords: reptiles, evolution, stimulant, conditioning, lower-vertebrates, nicotine

112.*Identifying and Characterizing Freshwater Microbes Affected By Agricultural Runoff

Ryan Williams[1], Grace Britt[2], and Rodney Tollerson ll[2]

1 Department of Biological and Environmental Science, University of West Alabama, Livingston, AL, 35470 USA

2 Auburn University

In freshwater ecosystems, algal blooms occur when there has been an increase in microbe growth from utilizing the nutrients from agricultural runoff. When agricultural runoff is present in the freshwater ecosystem, this will allow specific freshwater microbes to utilize the nutrients which in turn could cause them to produce toxins that can be harmful to that aquatic ecosystem, wildlife, and humans. Within this project, we are interested in how freshwater bacterial communities are able to react to the nutrients from agricultural runoff. In addition, we aim to identify what specific microbe's function is that corresponds with algal blooms or the process of algal blooms decomposition. The main objective of this research is to characterize and identify the microbes that are present in freshwater ecosystems and then see which microbes can utilize the nutrients from agricultural runoff using culture methods, microscopy, and 16S rRNA sequencing. Our findings have found that freshwater microbes can be selected on specific types of media containing phosphorus and/or nitrogen; thus, allowing us to sequence those bacteria to understand their role in the freshwater ecosystem and how they can accomplish such a feat from their genome. Overall, this project will help us gain an understanding of the function of bacterial communities that are present in freshwater ecosystems, and how some of those bacterial communities produce toxins and possibly be pathogenic when they utilize the extra nutrients from agricultural runoff.

Keywords: Algal blooms, 16S rRNA sequencing, genome, freshwater ecosystems, agricultural runoff, microscopy.

113.*Determining The Presence of *Staphylococcus aureus* on Athletes' Skin

Ryan Williams and Tracy Keener

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Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of *Staphylococcus aureus* that can cause skin infections or much worse pneumonia if allowed to travel deeper into the human body through cuts and abrasions. Since *S. aureus* is one of many bacteria that make up the microbiota on the human skin, it made us ponder if some of the *S. aureus bacteria* are MRSA on the human body; thus, making our research concentrate on individuals that part take in rigors and risky activities such as college sports to see if some *S. aureus* bacteria that make up their microbiota is actual MRSA. This research aims to swab volunteering college athletes in certain anatomical locations and use a type of agar that gives a color indication if MRSA is present from the swabbed anatomical location. For those *S. aureus* bacteria that grow onto the selective media that do not represent MRSA, I will perform a rapid biochemical testing to determine what kind of *S. aureus* bacteria is present. For future work, if MRSA is present from the swabbed anatomical locations we want to use 16s rRNA sequencing to determine what strain of MRSA was present on the college athlete's skin. Overall, swabbing college athletes to determine the presence of MRSA is a simple yet important epidemiological project that will allow us to see the number of college athletes who may or may not have MRSA present on their skin within the respective sport they participate in.

Keywords: 16s rRNA sequencing, Methicillin-resistant *Staphylococcus aureus*, *Staphylococcus aureus*, microbiota, skin infections, pneumonia

114.*Optimizing Nasopharyngeal Cancer Treatment: A Dosimetric Comparison of VMAT and IMRT

Muhammad Farhan

Ajman University, UAE

Introduction: Nasopharyngeal cancer (NPC) is primarily treated with radiotherapy due to its anatomical and biological characteristics. Advances such as Volumetric Modulated Arc Therapy (VMAT) have demonstrated potential for improving treatment precision while minimizing damage to organs at risk (OARs). This research aims to evaluate VMAT's ability to enhance treatment outcomes for NPC patients, compared to Intensity-Modulated Radiation Therapy (IMRT).

Objectives: This study aims to compare the dosimetric outcomes of VMAT and IMRT in treating NPC, focusing on target volume coverage and OAR sparing.

Materials and Methods: This study analyzed data from existing trials comparing VMAT and IMRT in NPC treatment. Dosimetric evaluations were conducted using a Dose-Volume Histogram (DVH) for planned target volume (PTV) and OARs. Additional indices, such as homogeneity index (HI), conformity index (CI), and OAR sparing, were considered across different clinical scenarios, including advanced-stage NPC.

Results: VMAT demonstrated superior target volume coverage, particularly in reducing radiation exposure to critical OARs such as the optic nerve, cochlea, and parotid glands, compared to IMRT. IMRT achieved better homogeneity in the tumor area, while VMAT provided better gross target volume (GTV) coverage. Both techniques showed comparable efficacy in protecting the mandible and parotid glands.

Conclusions: VMAT offers significant benefits in treating nasopharyngeal cancer, including improved tumor coverage and OAR sparing. Both IMRT and VMAT present distinct advantages depending on the specific clinical scenario. Further research is needed to optimize VMAT planning to maximize its efficacy and explore its long-term clinical benefits.

Keywords: VMAT, nasopharyngeal cancer, radiotherapy, IMRT, organs at risk, target volume coverage

115.*Analysis of Oral Health of Students at the University of West Alabama

Leah Stewart and Tracy Keener

Department of Biological and Environmental Science, University of West Alabama, Livingston, AL, 35470 USA

Proper oral hygiene is essential for maintaining good systemic health, as the mouth serves as a primary entry point for bacteria into the body. Virulent oral bacteria can spread to other parts of the body, increasing the risk of severe diseases, such as cardiovascular disease. Research suggests that oral hygiene practices often decline among undergraduate students, although this trend varies across different populations. This study, conducted via a Qualtrics survey, aims to assess the oral health-related knowledge, behaviors, and attitudes of students at the University of West Alabama. The questionnaire includes demographic questions alongside oral health-related prompts to identify connections between specific subgroups and oral health outcomes. Demographic factors include age, race, gender, college major, and parental professions. Prior research indicates that students majoring in pre-health fields and those with parents in healthcare professions tend to exhibit better oral hygiene practices. This survey will also explore the impact of environmental changes on oral health behaviors, as transitioning to a new and busy college environment can negatively affect students' routines. For instance, freshmen living in on-campus housing may be more likely to neglect oral hygiene without reminders from parental figures. Additionally, students' attitudes toward oral health will be evaluated to determine whether a positive or negative mindset exists on campus. The results of this survey will be used to identify areas for improvement and guide efforts to enhance oral health knowledge, behaviors, and attitudes among students at the University of West Alabama.

116.*Identification and Analysis of Oral Bacterial Isolates via Culturomics Approach

Leah Stewart, Patricia I. Diaz, and Takuma Suzuki

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A better understanding of intra-species diversity in the oral microbiome and strain-level associations with oral disease is needed. We aimed to create a subject- specific collection of cultivated isolates to facilitate future strain-level analysis of the oral microbiome. To achieve this, subgingival plaque was obtained from three different subjects and cultivated on eight different media in either anaerobic or aerobic conditions. 861 isolates comprising 103 species were obtained. All media and conditions tested appear necessary to capture a broad range of diversity. This culturomics- based approach recovers a large number of species and will be further employed to enhance the number of subject-specific collections of isolates, which will be genomically and phenotypically characterized in the future.

117.*A Comparative Analysis of Uterine Cancer Incidence in African American and White Populations in the U.S., with Emphasis on the Top Ten States with the Largest Black Populations

Christian Grayson, Faith Onomeh, Rosianna Gray, and Andy Chaudhuri

Biology, Department of Arts and Sciences, Stillman College, Tuscaloosa, AL 35401

Uterine cancer is a global health concern, primarily affecting the endometrial lining of the uterus, especially in postmenopausal women. Key risk factors include obesity, hormonal imbalances, family history, access to healthcare, and socioeconomic conditions. Early detection, particularly through symptoms like abnormal postmenopausal bleeding, can improve outcomes. Uterine cancer incidence varies by ethnicity, with some groups showing higher rates. This study examined uterine cancer incidence among African American and White populations across various U.S. states, focusing on the top ten states with the highest Black populations. Data on cancer incidences (per 100K individuals) from different age groups (under 50, 65 and older, and all ages) were obtained from the National Cancer Institute (NCI) and Centers for Disease Control and Prevention (CDC). The data were analyzed using GraphPad Prism 5 to explore racial disparities in uterine cancer. The results revealed that African American women over 65 experience 18% higher uterine cancer rates compared to White women. In contrast, among women aged 50 and below, White women have about 40% higher incidence rates. Cancer incidence data were reported for 38 states for African American women, while data for White women were available from all 50 states, even for those 65 and older. Notably, in all states, including those with the top ten highest Black populations, African American women consistently had higher uterine cancer incidences than White women. Interestingly, states such as Connecticut, the District of Columbia, Minnesota, and New York showed the highest uterine cancer rates (over 140 per 100K population), despite not being among the top ten Black population states. The study suggests that socioeconomic factors and disparities in healthcare access, including diagnostic and treatment options, contribute to the higher incidence of uterine cancer in the Black community. Additionally, Genetic factors may also contribute and warrant further study.

Keywords: Uterine Cancer, Health Disparities, Endometrial Cancer, Health Care

118.*Racial disparities in colorectal cancer across various U.S. states, with a particular focus on African American and White men and women

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Colorectal cancer, affecting the colon or rectum, is a leading cause of cancer-related deaths worldwide. Key risk factors include age, family history, diet, smoking, and a sedentary lifestyle. Early detection through screenings, such as colonoscopy, can significantly enhance survival rates. Ongoing research focuses on genetic mutations, early biomarkers, and advancements in treatment to reduce incidence and mortality. This study investigates racial disparities in colorectal cancer incidence across U.S. states from 2017-2021, concentrating on the ten states with the largest Black populations. Data on cancer incidences (per 100K individuals) from various age groups (under 50, 65 and older, and all ages) were sourced from the National Cancer Institute (NCI) and Centers for Disease Control and Prevention (CDC) databases. Using GraphPad Prism 5 for data analysis, we found higher colorectal cancer incidence rates in Black individuals aged 65 and older compared to White individuals in most of these states, with exceptions in Maryland and Delaware for women, and New Mexico for men. Overall, colorectal cancer tends to affect males more than females. Notably, among women aged 65 and older, Black individuals had higher incidences in 8 out of the 10 highest Black-populated states, while Black men had higher incidences in 9 out of the 10 states. The study suggests that disparities in colon cancer incidence between Black and White populations may stem from differences in healthcare access, socioeconomic status, delays in diagnosis, and genetic predispositions. Lifestyle factors, including diet and physical activity, further contribute to higher incidence and mortality rates in Black individuals. Genetic testing focused on germline mutations could offer valuable insights into these racial disparities in colorectal cancer.

Keywords: Colorectal Cancer, Health Disparities, Health Care

119.*A Comparative Study of Ovarian Cancer Incidence Between African American and White Populations in the U.S., Focusing on the Ten States with the Highest Black Populations

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Ovarian cancer, marked by abnormal cell growth in the ovaries, poses a significant health threat and is often referred to as a "silent" disease. It remains one of the leading causes of cancer-related deaths among women. Risk factors include age, family history, genetic mutations, and reproductive history. Early detection is challenging, but advancements in screening and treatment provide hope for better outcomes. This study analyzes age-specific ovarian cancer incidence across U.S. states to highlight racial disparities between Black and White populations. Cancer incidence data (per 100K individuals) from various age groups (under 50, 65 and older, and all ages) were sourced from the National Cancer Institute (NCI) and Centers for Disease Control and Prevention (CDC). The data were analyzed using GraphPad Prism 5 to assess age-specific ovarian cancer rates in Black and White females. Our results showed that ovarian cancer incidence data were available for 33 states for Black and 48 states for White populations aged 65 and older. Across all age groups, White females had higher ovarian cancer incidences than Black females in every state except Kansas. Interestingly, while White females had higher incidence rates, Black females experienced 18% higher mortality rates. Additionally, White females in six states—Arkansas, California, New Jersey, New York, and New Hampshire—reported higher incidence rates than in other states. We found no significant correlation between high ovarian cancer incidences and the ten states with the largest Black populations, except for Maryland. These findings suggest that the higher mortality rate in Black females, particularly in later ages, may be linked to disparities in healthcare access, quality of care, health benefits, and socioeconomic status.

Keywords: Ovarian Cancer, Health Disparities, menopausal hormone therapy, Health Care

120.*Comprehensive Examination of Disparities in Prostate Cancer Incidences by Race, and Age Over 65 Years in Alabama's Black Belt Counties, USA

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In the United States, significant disparities persist in cancer incidence, mortality, and treatment outcomes, particularly among Black populations. This study examines prostate cancer incidence among Black and White populations in Alabama's Black Belt counties, a region with a high concentration of Black residents. Alabama, with 24 designated Black Belt counties out of its 67 total counties, serves as a crucial focal point for understanding these disparities. Data on cancer occurrences from 2016-2020, obtained from the National Cancer Institute (NIH) and the Centers for Disease Control and Prevention (CDC), were analyzed using GraphPad Prism 5, focusing on men aged 65 and older. We observed a significantly higher incidence of prostate cancer among Black males compared to White males in all the 24 Black belt counties. Specifically, Black men in the Black Belt region experienced more than 100 % higher incidence of prostate cancer compared to White men. While a small number of counties in the Black Belt had unreported incident data, this did not significantly impact on the overall trends observed. This disparity in incidence is further reflected in mortality rates, with African American men experiencing more than twice the prostate cancer of non-Hispanic Caucasian men. Several factors likely contribute to these disparities, including genetic predispositions, socioeconomic status, healthcare accessibility, systemic biases, and cultural influences. Access to early detection and treatment also plays a critical role in prostate cancer outcomes. Disparities in access, often linked to socioeconomic factors and systemic biases, may contribute to later-stage diagnoses and poorer prognoses among Black men. These findings highlight the urgent need for targeted interventions to address these disparities and improve prostate cancer outcomes for Black men in the Black Belt region. Future research should also explore the specific genomic variations that may contribute to these disparities.

Keywords: Prostate Cancer, Racial Disparities, Healthcare Access, Black Belt region, Public Health

121.*Improving Meat Shelf Stability Using Modified Electrolyzed Water

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Extending the shelf-life of meat is a critical challenge in the food industry and for every household. Current methods often rely on chemical and physical preservations, which can affect meat quality and raise consumer concerns, including health and palatability. Electrolyzed water (EW) presents a promising alternative for microbial reduction due to its strong antibacterial properties and no detectable negative impact on food quality. Previous studies have highlighted the effectiveness of various forms of EW against foodborne bacterial pathogens, including pH-adjusted EW and EW generator types, but its application for improving meat safety and shelf-life has been under-explored in practical settings. This study aimed to evaluate the use of homemade EW (HEW) in reducing bacterial load and extending the shelf-life of meat products, including beef, pork, and poultry, through a household-modified preparation and application process. HEW was prepared using a portable, household-affordable generator. The lab contributed bacterial cultures, including a food spoiler, Pseudomonas flurescens. Commercially-acquired meat samples were treated with HEW in different combinations of time, concentration, and application mode and relatively analyzed for bacteria survivors with controls using aerobic plate count (APC) and most-probable-number (MPN) methods. The study also assessed the effects of HEW treatment on sensorial characteristics, including texture, odor, and appearance, relative to controls. Relatively, antibacterial evaluation of meat samples, including beef, chicken, and pork, did not exhibit significant CFU/mL reduction variations as compared to controls. Further, the 48-h EW post-treated samples did not reveal visible variations in meat homogenates relative to controls.

Underway findings from this research, including HEW antibacterial treatment combinations and time-dependent sensorial effects, are expected to demonstrate the potential of HEW as a sustainable method for reducing food spoilage and loss, offering valuable insights for small-scale meat producers and the broader food industry.

Keywords: Meat safety, electrolyzed water, antibacterial, foodborne bacterial pathogens, shelf-life

Interdisciplinary

122. The Future of Research at the University of West Alabama

Shauncey Hill and Amy Carroll

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The NORDP Consultants Program exists to provide high-quality research development services at no cost to participating institutions of higher education (IHE). A group of NORDP consultants has been assigned to work with UWA over the next 18 months to identify areas for improvement in its research infrastructure. This poster will summarize initial findings, propose possible investments and engage with poster session attendees to gather feedback.

Physical and Life Sciences

123.*Endophytic Fungi as Natural Growth Promoters: Identifying Novel Plant-Fungal Symbioses for Sustainable Crop Enhancement

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Global food insecurity remains a critical challenge as population growth demands increased agricultural productivity. While agrochemicals have enhanced crop yields over the past century, their use has led to significant environmental concerns, including soil degradation, pesticide resistance, ecosystem disruption, and potential carcinogenic effects. Plants naturally form beneficial symbiotic relationships with microorganisms, particularly fungi, which enhance growth and stress tolerance. This study aims to identify and harness naturally occurring endophytic fungi as sustainable alternatives to agrochemicals for improving crop productivity. We surveyed 20 wild plant species and identified 67 endophytic fungi across 46 genera. We evaluated selected fungi's effects on tomato seedling development in controlled growth chamber experiments. Seedlings were cultivated in symbiotic and non-symbiotic MS media for 8 days, with measurements recorded on days 1, 5, 7, and 8 ($n=30$ per treatment). Corynespora sp. (A67) demonstrated a 45% increase in shoot growth and a 15% increase in root development compared to controls ($p<0.05$). Edenia sp. (#36) showed a 30% enhancement in shoot growth and a 12% increase in root development, with superior performance under stress conditions. These findings suggest Corynespora and Edenia sp. fungal isolates hold significant potential for agricultural applications, particularly in stress-prone environments. Further research will focus on full-cycle plant development, crop yield assessment, and food quality analysis to validate these fungi as viable alternatives to conventional agrochemicals.

124.*The Bioremediation of PFOS by Green Microalgae

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Perfluorooctane sulfonate (PFOS) is widely used in various industrial products, including carpets, rugs, and leather products. As a "forever chemical," PFOS does not degrade naturally, leading to persistent accumulation in the environment and living organisms. Due to its potential environmental and health hazards, many countries have imposed strict regulations on PFOS usage, as prolonged exposure may pose significant risks to human health. Current strategies being explored for PFOS remediation involve the use of bacteria, green microalgae, and hydrophytes. In this study, we explore the bioremediation potential of *Chlamydomonas reinhardtii* for PFOS.

The algae were grown at 27°C and 70 rpm until the exponential to stationary growth phase. Nine vials of green algae were used in the experiment, three were treated with 100 ppb PFOS, three with 250 ppb PFOS, and three were left untreated (negative control). In addition, a total of six vials of growth medium without green algae were treated with PFOS, three at 100 ppb and three at 250 ppb (positive controls). After incubation, the PFOS treated algae samples along with positive and negative controls were analyzed using matrix-assisted laser desorption mass spectrometry (MALDI-MS). Data were compared to PFOS solutions incubated without algae to evaluate if the algae can degrade the forever chemical.

125.*The Susceptibility of Streptococcus Mutans in Dental Caries and the Utilization of Oral Health Practices

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As children you were always told to floss and brush your teeth every morning and night before bed by your guardian(s) and dentist. Little did you know, oral health is more important than you would think. Oral health is known as the window to our overall health. Most diseases start from the mouth such as tooth decay or gum disease which may travel and affect other parts of the body like the heart or cause sepsis which is a life-threatening condition. This is because the mouth is a thriving environment for many bacteria like *streptococcus mutans* due to its wet, warm ecosystem it possesses.

126. *The effects of restraint stress on correlations of testosterone and corticosterone levels with degree and latency to body color alterations in male Anolis carolinensis

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Understanding the relations of stressful impacts on color and hormonal changes in *Anolis carolinensis* is vital when utilizing this species for behavioral and neuroendocrine studies. From previous research, we know that the species is very stress sensitive especially during and after social interactions. This stress is most observable through post orbital darkening (eyespot formation) and change in body color from the normal bright green to a brownish color. We plan on measuring testosterone, changes in corticosterone, and the change in body color in response to restraint stress. We hypothesize that the levels of testosterone will correlate with speed of body color change, and corticosterone levels will be greater in animals that turn more brown in color.

127.*Repeated agonistic interactions with reflective opponent in male Anolis carolinensis (green anole)

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Visual stimuli and behavioral response are important indicators of social status in many vertebrates. A series of visual displays can be used to identify dominance in socially interactive species. This study looks to examine aggressive displays and self-recognition of Anolis carolinensis (Green anole or American chameleon) to repeated mirror exposure within a controlled laboratory setting. Male A. carolinensis remember previous opponents for up to 7 days after a 10-minute introduction, and therefore they have the cognitive machinery to identify specific individuals. According to previous studies, A. carolinensis vigorously responds to mirror image of themselves, and regions of the brains limbic system are altered depending on the manipulation of their sign stimulus, the eyespot. Darkening of the eyespot directly influences aggression of opponents and acts as a visible signal of social status (Korzan et al. 2000). Previous studies in higher vertebrates have demonstrated the complex behavior of self-recognition in social animals. Anoles vigorously respond to mirror image of themselves, and we hypothesize that they too may be able to recognize self versus another lizard and reduce aggressive response to mirror image over multiple exposures. To test this theory of the complicated behavioral responses (self-recognition), the experiment will follow experimental design similar to Korzan et al. 2006. We hypothesize that with increased encounters with a reflective opponent, Anolis carolinensis will exhibit fewer aggressive behaviors, due to recognizing image is self and not another opponent.

128.*A Comprehensive Study on Congenital Cataracts: Public Perception, Survey Findings, and Literature Insights

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Congenital cataracts, a rare condition causing lens clouding in infants, can lead to severe visual impairment if untreated. Despite the importance of early diagnosis, public awareness remains limited. This study examines public understanding of congenital cataracts and their perceived impact on daily life through a survey of 20 participants. Findings revealed that while most participants were familiar with cataracts, few were aware of congenital cases, especially younger adults. Many associated cataracts with aging, highlighting a gap in recognizing childhood cases. Although most expressed willingness to undergo surgery, concerns about recovery and complications were common. These results emphasize the need for targeted educational efforts to improve awareness, promote early detection, and reduce the risk of visual impairment in affected children.

129.*Characterization and optimization of homemade electrolyzed water for safeguarding produce safety and quality

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Introduction. Electrolytically modified water, including electrolyzed water, is a practical, green alternative for improving food safety and quality from microbial pathogenic and spoilage contaminants; however, homemade electrolyzed water's (HEW) effectiveness is experimentally under-explored.
Purpose. Consequently, we evaluated HEW for its antibacterial and preservative characteristics.
Methods. Commercial HEW generators from four manufacturers were employed alongside food-grade mixtures, including NaCl, vinegar, and tap water, as instructed by the manufacturers. Diverse HEW products by NaCl concentration and pH were adjusted using commercially available iodized NaCl and vinegar, respectively. HEW antibacterial test was conducted using agar diffusion, spraying, and immersion methods, followed by bacterial inoculation and colony/MPN enumeration. Its preservability was visibly determined per HEW solution turbidity-containing tomato and the health of the HEW-treated (by quick immersions) plant after ambient incubation. The effect of HEW on tomato-inherited quality was automatedly assessed for color (ΔE*), hardness (N/mm^2), pH, vitamin C/lycopene/β-carotene (mg/100g), flavonoids (mg RE/100g), and phenolics (mg GAE/100g).
Results. The antibacterial activity was poorly notable on bacterial lawn-containing agar spotted with HEW. Subsequently, bacterial inoculation (contaminated or intentional) followed by immersion (>5-log CFU/mL) exhibited a relatively immense bacterial reduction compared to spraying (3-log CFU/mL) ($P<0.05$). Noteworthily, slightly acidic HEW (pH 5.3), prepared with 23% NaCl in one of the HEW generators and applied immediately by immersion or spraying, immensely increased HEW antibacterial activity relative to other conditions examined. HEW immersed and kept tomatoes, diluted solutions, and immersed and removed sick plants revealed HEW preservability potentials, as visibly noted by bacterial growth turbidity in immersion solution, MPN solution, and plant health condition, respectively. Subsequent automated analyses at post-HEW treatment did not pose a significant ($P>0.05$) effect on tomato organoleptic and nutritional values.
Significance. This study reveals HEW limitations and produce-friendliness for the first time and suggests that HEW's antibacterial effectiveness could be leveraged by NaCl concentration, pH, generator, shelf-life, and immersion.

130.*Pea Starch-Fatty Acid Inclusion Complexes: Fabrication, Characterization, and Digestibility

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Starch can be classified into three categories based on its digestibility: rapidly digestible starch (RDS), slowly digestible starch (SDS), and resistant starch (RS). RS is usually regarded as a component of dietary fiber with numerous health benefits, including improved glycemic control and gut health. Among various types of RS, Type V RS, or RS5, which is formed through inclusion complexation between starch and guest compounds, offers enhanced enzymatic resistance, thermal stability, and tunability due to the selection of guest compound. Pea starch is a common byproduct of commercial pea protein production and thus presents an opportunity for value-added utilization and enhanced nutritional benefits if methods can be developed to enhance its RS content. This project aims to determine how inclusion complexation with fatty acids of varying chain lengths affects the RS content of pea starch. To form inclusion complexes, two different methods were used: the dimethyl sulfoxide (DMSO) method and the empty "V" method. Four types of guest compounds, dodecanedioic acid, palmitic acid, stearic acid, and ascorbyl palmitate, were used. The resulting samples were then analyzed using differential scanning calorimetry (DSC), X-ray diffraction (XRD), and *in vitro* simulated digestion to determine if the inclusion complex was formed and the impacts on RS content.

131.*Testing Mosquitos For Viral RNA

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While there are many species that can cause harm to humans, the mosquito is likely the most deadly animal on Earth. According to the World Health Organization, mosquito-borne illnesses account for more than 17% of all infectious diseases and cause more than 700,000 deaths annually. While treatments and vaccines exist for many of these illnesses, knowing which ones are most likely to occur is difficult due to the wide variety of illnesses. This research project aims to determine which illnesses tend to be most common in mosquitos in the state of Alabama. During this project, we collected mosquitos from rural, urban, and suburban environments with Bug Zapper Solar Trap Model: SE563, to which we added a BG-Sweetscent mosquito attractant packet. These mosquitos were then preserved in ethanol and later tested with a QIAamp DSP Viral RNA Mini Kit to determine if viral RNA was present in the sample. This project is currently ongoing with results pending.

Keywords: Mosquito, mosquito-borne illness, viral, RNA, disease

132.**Prevalence and Characterization of Vagococcus lutrae in Seafood

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Introduction: Vagococcus lutrae is an emerging human pathogen attributed to the increasing hospitalization cases in humans; however, its investigation-relevant biology and epidemiology are efficiently limited to date.

Purpose: The present study explored V. lutrae's isolation and cultivation conditions, prevalence, and biology.

Methods: Raw (n=28) and cooked, ready-to-eat (n=7) seafood products were acquired from estuarine environments, wet markets, retail stores, and a local restaurant. Using a two-step enrichment method, presumptive V. lutrae contaminant in enriched alone (1-step) and enriched followed by heated (80 °C) (two-step) seafood was selectively cultured on thiosulfate–citrate–bile salts–sucrose (TCBS) agar, and bacterial colonies were streaked for purification before 16S rRNA bacterial identification. Confirmed V. lutrae isolates were further analyzed for their glucose, oxygen (parafilm-wrapped/none parafilm-wrapped agar plates) and salinity requirements, thermal (63 °C and 80 °C) and antibiotic sensitivity profiles, and hemolytic virulence.

Results: Of 124 bacterial isolates from raw (76) and cooked (48) seafood organisms, 19 (15.3%) confirmed V. lutrae were exclusively recovered from crab (2), shrimp (10), lobster (6), and cooked shrimp (1). Of these, 3 (15.8%) and 16 (84.2%) were regular (1-step) and heat-resistant (2-step) isolates with exclusive black or yellow color colonies on TCBS agar. They were more prevalent in raw (21.4%) than cooked seafood (14.3%). Carbohydrate-, oxygen-, saline-required, and thermal-challenged growth assays revealed its tolerance capacity against glucose (0-2%), oxygen, salinity (0.5-20.5%), and extended high-temperature exposure (63 °C, 8 h), and that these conditions could dictate its culturable viability in suspension or agar plating cultivation. Antibiotic sensitivity assay revealed differentially sensitive isolates to doxycycline and gentamycin. Subsequently, the hemolysis assay of select isolates exhibited no visible hemolytic activity.

Significance: Emerging foodborne pathogen contaminants could readily invade the established food safety regime. The present improved knowledge pertaining to V. lutrae isolation, cultivation, prevalence, and biology can enhance its detection, investigation, food safety, and public health.

133.**Silicon Nanoparticles: A Novel Solution for Plant Resilience Under Abiotic Stresses Induced by Climate Change

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Human activities aimed at catering to the needs of an ever-growing population, have exacerbated climate change, making it one of the most significant challenges of the century, posing serious threats to environmental sustainability and agricultural productivity. Crops encounter different abiotic stresses, such as drought, salinity, and heavy metals at various growth stages, that severely impact crop yield worldwide by disrupting plant physiological processes, leading to reduced productivity and food insecurity. In response to these challenges, recent advancements in nanotechnology have opened new possibilities for crop resilience, with silicon nanoparticles (SiNPs) emerging as a promising solution. Due to their small size and large surface area, SiNPs have higher solubility, enhanced penetrating ability, and greater reactivity, making them effective at regulating plant metabolism. This study highlights the sustainable method of silicon nanoparticle synthesis and their role in enhancing plant tolerance to abiotic stresses through their unique properties and specialized mechanisms. The adoption of such an approach offers a sustainable and innovative solution to improve agricultural productivity and contribute to food security in the face of climate change.

Keywords: silicon nanoparticles, abiotic stress, sustainable

134.**Zeolite-Based Nitrogen Nano-fertilizers: A Climate-Smart Alternative

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As climate change intensifies, the agriculture sector faces unprecedented challenges in ensuring food security while minimizing environmental impacts. Conventional fertilizers, despite having efficacy in productivity, can lead to the alarming damage to the environment through greenhouse gas emissions, soil acidification, disruption in soil microbial community, leaching and so on. The nano-fertilizers such as that based on zeolite are emerging as a sustainable solution in agriculture, offering enhanced nutrient delivery and improved crop yields. Zeolites, naturally occurring aluminosilicate minerals, has large internal porosity aiding in the water retention and trapping the nutrients in its pores and high cation exchange capacity abetting for the nutrient retention, especially for NH4+ and K+. In addition, it can favor a diverse range of microbial species due to the controlled nutrient release mechanism far from the conventional fertilizers that impairs the beneficial microbial communities. Zeolite-based nitrogen nano-fertilizer is considered a climate-smart alternative to conventional nitrogen fertilizers due to its unique properties. This study aims to explore the potential benefits of zeolite-based N-nanofertilizers relative to the conventional fertilizers concerning their environmental impact, effect on productivity of crop and soil microbial communities.

Keywords: Nano-fertilizer, zeolite, climate, soil-microbes

135.**Impact of Ultrasound-Assisted Freeze-Drying on Carrot's Nutritional Value, Beta-Carotene, Bioactive Compounds, and Microstructure

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The University of Alabama

This study addresses a gap in understanding the combined effects of ultrasound pretreatment and freeze-drying on the nutritional quality, beta-carotene content, bioactive compounds, antioxidant activity, and microstructure of carrots. Previous research has explored various pretreatment methods, but there is limited focus on ultrasound pretreatment to enhance the nutritional value and health benefits of freeze-dried carrots. The research explores how ultrasound pre-treatment can enhance the functional and nutritional properties of dehydrated carrots compared to conventional drying methods. Methods include AOAC, AAS, and spectrophotometric techniques to evaluate the nutritional value, mineral profile, carotene content, and bioactive compounds. SEM analysis assessed microstructure, while antioxidant activity was evaluated through DPPH assay.

Findings revealed that ultrasound pretreatment improved several quality attributes of dehydrated carrots, including higher fat (1.42%) and protein (8.4%) content in freeze-dried products compared to other samples. Mineral content was highest at 30 kHz for five minutes, while beta-carotene content peaked at 987.9 mg/100g for 30 kHz and three minutes. Ultrasound pretreatment also improved physical properties compared to hot air and freeze-dried products. Total phenol (3.74 mg/100g), flavonoid (9.45 mg/100g), and antioxidant activity (88.6%) were highest at 30 kHz for five minutes, although ascorbic acid content decreased. The carrot's microstructure showed a more porous texture with ultrasound processing, indicating better moisture migration during dehydration. The study concludes that ultrasound pretreatment, particularly at 30 kHz for five minutes, enhances the bioactive compounds and antioxidant activity of dehydrated carrots, resulting in a more porous structure and improved overall quality compared to conventional drying methods. This finding offers an effective alternative to conventional drying techniques, with implications for the food processing industry by retaining nutrients and improving the health benefits of dehydrated products, advancing food preservation methods through integrating ultrasound into drying processes to enhance product quality.

136.**Disentangling the neural mechanisms of migration from reproduction in White-crowned Sparrows (Zonotrichia leucophrys)

Maddie Jackson and Jonathan Perez

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Because environments are not static in both space and time, organisms partition major life events into distinct life history stages to maximize fitness. Photoperiod is a critical and reliable cue used by many species to time seasonal life history events, such as migration and reproduction. Photostimulation, the artificial elongation of daylength to simulate spring conditions, is commonly used in the laboratory to trigger migratory and reproductive physiology. However, few if any studies have been able to isolate the neural mechanisms of migration from reproduction. We aim to utilize a green light paradigm, previously shown to potentially dissociate migratory and reproductive physiology, to determine the neural mechanisms specifically associated with migration in White-crowned Sparrows (Zonotrichia leucophrys). Birds will be exposed to green light under spring photoperiod conditions (n=6; 16h dim green light [L]:8h very dim green light [DvDG]) while another group will be exposed to spring photoperiod conditions under bright white light (n=6; 16L:8DvDG). We will assess migratory characteristics, such as fat deposition, muscle hypertrophy, and nocturnal restlessness (Zugunrhue), to monitor the onset of the migratory life history stage. The photostimulation experiment will be terminated either at the end of 30 days or once birds exhibit consistent Zugunrhue. Following exposure, transcriptomic data generated from target neural tissue will be used to compare gene expression levels across treatment groups. This study can offer important information about migration, relevant to birds who are facing rapid decline across multiple species, and could fill knowledge gaps surrounding the neural mechanisms of migration.

137.**Nanoparticles based techniques in Aflatoxin B1 Detection: A Response to Climate-Driven Food Safety Concern

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Global food safety is greatly impacted by climate change which alters environmental factors like temperature, humidity, and rainfall, which intensifies conditions conducive to Aflatoxin-producing fungi (*Aspergillus flavus* and *Aspergillus parasiticus*). These fungi produce Aflatoxin B1, the most toxic and carcinogenic aflatoxin, posing severe health risks: liver cancer and immunosuppressive effects. Also, aflatoxin contaminations lead to economic burdens, particularly in regions heavily reliant on staple crops such as maize, peanuts, and cereals. These effects call for innovative and rapid methods such as nanoparticle-based techniques for easy detection of Aflatoxin B1 levels in crops. Presently, chromatography and Enzyme-linked Immunosorbent Assay (ELISA) are frequently constrained by their high cost, complexity, and lack of sensitivity for low-concentration Aflatoxin B1 detection. This necessitates the development of sensitive, cost effective and accessible detection techniques to carryout real time and on-site detection. Nanoparticles, due to their unique optical, physical and chemical properties, offer promising solutions for the sensitive, specific and rapid detection of aflatoxin B1. Recent advancements in nanomaterials, including metal nanomaterials and carbon-based nanomaterials such as quantum dots, have demonstrated enhanced efficacy in detecting Aflatoxin B1 even in trace concentrations. This study explores the role of nanoparticle-based sensors and techniques in detecting Aflatoxin B1 in the face of evolving environmental challenges.

138.**Interspecies dyad interactions of native lizard Green anole (Anolis carolinensis) and invasive Brown anole (Anolis sagrei): Behavioral and physiological observations in a controlled laboratory setting

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Green anoles (Anolis carolinensis) are North America's only native anole. Brown anoles (Anolis sagrei) are native to Cuba and the Bahamas but were first documented off the Florida Keys in 1940; their populations have since exploded leading to the spread of this invasive species throughout the Southeast United States. We acquired adult male A. carolinensis and A. sagrei from commercial suppliers and placed them into one half of a divided 10gal terrarium. Each half contained one A. carolinensis or one A. sagrei that were sized-matched by weight. On the 8th day of acclimation, a conspecific female was introduced to measure latency to signal reproduction. Interactions between male A. carolinensis and A. sagrei were stopped at 10, 20, and 30 minutes. Removal of the opaque divider started the interaction, and a GoPro was used to remotely record them. Concluding interactions, the subjects were rapidly decapitated, and their blood and brains were collected and frozen on dry ice, stored at -80°C. Plasma and brains will be taken to ERDC (Army Corps of Engineer Research and Development Center) and analyzed for catecholamines. Videos were manually scored for aggressive behaviors and results were tallied. A. sagrei are slowly moving further North, continuing to displace local A. carolinensis populations, leading to extirpation. We hypothesize that these controlled laboratory behavioral and physiological experiments using proven methods and husbandry will give us insight into how two males of different species perceive each other during the breeding season.

139.**A Spotlight on Alabama's 31 Endemic Vascular Plant Species Through Botanical Illustration

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By some estimates, Alabama is the fourth most biodiverse state in the United States due primarily to its rich geological diversity, biodiverse waterways, and great range of ecoregions. Alabama's biodiversity includes 144 endemic species, defined as those restricted to a geographical area, such as a state or county. Of those species, Alabama has 31 endemic vascular plant species many of which are relatively newly described and are in need of more study to fully understand their biology. Botanical illustration is an essential tool in understanding botanical diversity by highlighting defining and salient morphological features in a single illustrated plate that single photographs or specimens cannot capture. Illustrations also lead to better communication and dissemination of information about the illustrated species. In turn, this facilitates researchers to potentially discover more populations and create specific conservation efforts that would most benefit species' preservation because of tangible identification comparison. This research aims to illustrate all 31 endemic plant species of Alabama to create a foundation that researchers can employ when conducting further research on these plant species and a tool they can use while out in the field. Plant specimens will be collected directly from the field, and additional data will be gathered utilizing published reports and the original protologues. Illustrations will then be created through direct observation in the field and specimens utilizing a trinocular dissecting light microscope.

140.**Vascular Flora Inventory of the UWA Cahaba Biodiversity Center in Central Alabama

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A substantial land donation was given to the University of West Alabama in 2019 which led to the creation of the UWA Cahaba Biodiversity Center (CBC). At the southwestern terminus of the Appalachian Mountains, the CBC spans just over 2,100 acres along four miles of the Cahaba River and has been developed into an educational and research field station. The CBC serves as a large conservation area dedicated to educating the public about biodiversity, conservation, and land use management. Since its acquisition, little systematic botanical and zoological inventory studies have been conducted (except for ongoing mammal studies) leaving much of the CBC biologically underexplored. Inventorying is the first step in biological conservation, as it helps document ecosystems and enhances our understanding of how to protect them. Among all 50 states, Alabama ranks fourth in biodiversity, with the Cahaba River drainage being a key hotspot for biodiversity in central Alabama which is why biological inventory is essential. This study aims to conduct a vascular flora inventory of the entire CBC. Field surveys will be conducted to identify the various ecosystems within the CBC. All vascular plant species will be documented using two methods: field collections with standard herbarium techniques and digital documentation via the iNaturalist application. All specimens will be identified and deposited in the University of West Alabama Herbarium (UWAL). Data from this study will be combined with previously collected records since the CBC's acquisition in 2019. The accumulated data will highlight species richness, document rare and invasive species, and assess the overall flora of the CBC. The findings from this study will contribute to future conservation efforts and establish a baseline for additional research opportunities.

141.*Cis*-acting Regulatory Elements and Nucleotide Content

Morgan Seymour, Giulianna Rivero, Kenaz Knowles, Brayden Varnado, Mary Katherine Swanson Lee, Loren Belle Evans, Jordan Evans, Torry Robertson, Wisam Dalati, Mykael Ledet, Danequa Buchanan, Charmaine Smith, Gabrielle Terrel, and Alexander Kofman

Troy University

The functional microRNA targets, which are considered to be key *cis*-acting regulatory elements, are positioned within the mRNA 3'UTR. The presence of *cis*-acting elements may be related to the specific nucleotide content of the gene fragment. We analyzed the nucleotide content of the 3'UTRs of the 186 human mRNAs (NCBI database). Our results indicate that G-C content is lower within 3'UTR as compared to the whole mRNA sequence. Furthermore, we found a moderate negative correlation between the G-C% and the length of the short (500-1400) 3'UTRs. It can be explained by the presence of the polyA tail within the 3'UTR at the very end of the mRNA. However, according to our data, the lower G-C% is due to a decrease of the C%. To further elucidate the impact of the 3'UTR on gene expression, more studies are needed to explore the nucleotide content within the 3'UTR of various lengths and compare the results with the distribution of the microRNA-binding sites.

Social Sciences and Humanities

142.*Shaping her Story: Queen Emma & The Encomium

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In AD 984, Emma of Normandy was born to Richard I, Duke of Normandy and Gunnor, Duchess of Normandy, and experienced a delightful and educational upbringing. Eighteen years after her birth, Emma was betrothed and married to King Ethelred II (the Unready) of England, and in 1002, Emma made a historic mark in England by becoming the first English queen of Danish descent. This was not, however, the only mark that Emma left on English history.

The Encomium Emmae Reginae, completed c. 1041, continues to tell of Emma's virtues. After the death in 1135 of her second husband, King Cnut of Denmark, Norway, and England, Emma sponsored the Encomium. This work helped to establish a claim to the position of joint ruler with her sons. Harthacnut and Edward the Confessor, as they successively ruled England. Emma used the Encomium to cement her co-regnal relationship with her sons, after being granted the right to assist in helping King Cnut in various roles as Queen of the English. After the death of Harthacnut, however, Edward the Confessor reigned as the King of the English from 1042 to 1066, and Emma was left without a position and title up until her death in 1052.

The Encomium Emmae Reginae offers modern readers details of the life and role of Queen Emma. As the Encomium was written to praise Emma, it explores her accomplishments during her marriages to two successive kings of England, Ethelred the Unready and Cnut the Great.

In this poster, I demonstrate that Queen Emma commissioned the Encomium to hold herself in high regard in an attempt to "rewrite" history to withhold the negative truths that would have been associated with her name at the time she reigned as Queen of England. This poster also contextualizes Emma's self-presentation in the Encomium with a more balanced consideration of her long period as Queen and Queen Mother of England.

Education

143. Towards Professionalization of Teachers and AI Integration in Teacher Education AI-TPACK to pedagogically integrate artificial intelligent (AI)-based tools into education

El Guennouni Mohammed and Mostafa El Mallahi

Sidi Mohamed Ben Abdellah University, Morocco

The demands placed on teachers today are much more complex than they were in the past. Two centuries ago, their role was primarily limited to imparting knowledge within their areas of expertise. Today, teaching is recognized as a multidimensional profession requiring a wide range of specialized skills, encompassing subject expertise, advanced pedagogy, and proficiency in modern educational technologies, including AI. This transformation is largely attributed to the foundational work of Shulman (1986), who emphasized the importance of combining disciplinary knowledge with pedagogical skills in teaching.With the rapid evolution and diversification of educational technologies, teachers must now develop a strong understanding of technology in addition to their traditional competencies (Mishra & Koehler, 2006). Modern technologies play a key role in enabling teachers to adopt innovative methods and stay current in their disciplines. Effective use of these technologies is essential for creating engaging learning experiences and preparing students to face the challenges of the digital age.

In this context, theoretical frameworks such as the TPACK (Technological Pedagogical and Content Knowledge) model and the SAMR (Substitution, Augmentation, Modification, and Redefinition) model are central. The TPACK model, developed by Koehler and Mishra (2006), offers a holistic approach by emphasizing the intersection of technology, pedagogy, and content knowledge. This framework encourages educators to design tailored and effective strategies for integrating technology. The SAMR model, on the other hand, outlines a progression that allows teachers to move beyond simple technological substitution to profoundly transforming their pedagogical practices (Puentedura, 2006).Through these frameworks, teachers can create dynamic and adaptive learning environments, fostering the development of the skills students need to succeed in an increasingly digital world.

Interdisciplinary

144.Research Experiences for Undergraduates

Claudia Scholz

University of Virginia School of Data Science

This presentation will outline 1) the variety of summer research experiences available for undergraduate students, 2) why students should consider this type of opportunity, and 3) how to prepare a successful application.

Physical and Life Sciences

145. Electrospinning Active Packaging of Cold-fresh Pork based on Zein and Theaflavin

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Cold-fresh pork is a widely consumed meat product; however, its high perishability presents substantial challenges in maintaining quality and safety during storage and transportation. Active packaging has emerged as an innovative solution to extend the shelf life and preserve the quality of cold-fresh pork by incorporating functional additives into packaging materials. Among potential additives, theaflavin, a natural antibacterial agent, demonstrates significant potential for protecting cold-fresh pork. The growing demand for active food packaging derived from natural materials is largely motivated by the aim of reducing environmental impact. In this context, green electrospinning from biopolymers with antimicrobial compounds is considered an ideal candidate for constructing ultrathin, excellent performance, and effective antibacterial fibrous films (FFs). This study utilized green electrospinning of zein (Z) from an ethanol-aqueous solution incorporating theaflavin (TF) at varying concentrations (0.6–4%) to develop active packaging materials for cold-fresh pork. The resulting Z/TF composite fibrous films (ZTF-FFs) exhibited smooth and uniform surfaces, with an increase in average fiber diameter from 484 nm to 705 nm as TF concentration increased. The addition of TF modified the secondary and crystalline structure of Z-FF, as confirmed by Fourier-transform infrared spectroscopy and X-ray diffraction analysis. Among the formulations, ZTF1-FF, containing 1% TF, demonstrated enhanced thermodynamic stability, with a decomposition residue of 13.88% and a maximum mass loss rate temperature of 313.45°C. ZTF1-FF also exhibited remarkable hydrophobicity, superior mechanical properties, and significant antibacterial activity against *S. aureus* and *S. paratyphi B*. When applied as active packaging of cold-fresh pork, ZTF1-FF significantly mitigated increases in total volatile basic nitrogen, total viable count, pH, weight loss, and thiobarbituric acid reactive substances of the pork. In summary, ZTF1-FF demonstrates considerable potential as an active food packaging material, particularly for preserving cold-fresh meat, offering a sustainable and efficient solution to enhance food safety and quality.

Keywords: electrospinning, nanofibers, active food packaging, theaflavin, cold-fresh pork

146. Development of an Anthocyanin-Based Intelligent Tag for Visual Monitoring of Salmon Freshness

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Salmon, widely consumed for its rich nutrients and health benefits, is prone to rapid spoilage due to microbial activity and chemical changes. As a result, ensuring the freshness of salmon during transportation and storage is paramount to protect consumer health and minimize food waste. Traditional methods for monitoring seafood freshness, such as sensory evaluation, chemical analysis, and microbiological testing, are often time-consuming, invasive, and require specialized equipment. Developing intelligent packaging, such as intelligent tags, could be capable of providing real-time, non-invasive indicators of food freshness. Among various approaches, the use of bio-based indicators derived from natural pigments has gained significant attention due to their sustainability, affordability, and sensitivity to environmental changes. Anthocyanins, natural water-soluble pigments found in fruits and vegetables, exhibit color changes in response to pH variations and are particularly promising for monitoring food spoilage, where pH changes are a key indicator of freshness deterioration. Therefore, this paper explores the development of an intelligent tag using anthocyanin-based indicators loaded on electrospun zein nanofibers to visually monitor salmon freshness. With 1.5% addition of anthocyanin-based indicators, the intelligent tag shows a flat appearance with an average fiber diameter of 454.8 nm and water contact angle of 129.0°. Its color changes to red in a hydrochloric acid environment and turns purple in an ammonia-water environment, possessing a relatively sensitive pH color response capability. During the visual monitoring of salmon freshness for 10 days, its color changes from red (fresh) to pink (sub-freshness) and finally to purple (spoiled) with its corresponding color difference value above 5 (the distinguished value of human naked eye). These results suggest promising applications in the field of intelligent food package for real-time dynamic monitoring of aquatic product freshness.

Keywords: electrospinning, zein, anthocyanin, color response, intelligent food package

147. Brief Overview of Analytical Chemistry Instrumentation: Techniques and Applications

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Analytical chemistry has been instrumental in matter's separation, identification, quantification, and behavior. It has diverse applications in various fields, including but not limited to health, pharmaceutical, environmental, and forensic departments. This talk will discuss some of the analytical techniques and instrumentation tools that are commonly employed to characterize materials for the advancement of scientific research. It gives a basic introduction to the operating principles of these analytical tools, and their applications will be discussed. The talk will also discuss how various analytical tools could be employed to optimize and tailor the performance of high-performing polymers in additive manufacturing or 3D printing.

148. Asymmetric Distribution of microRNA Target Sites within 3'UTR: Implications for Evolutionary Genomics and Bench to Bedside Research

Alexander Kofman

Troy University

Mammalian microRNAs interact with their mRNA target sites and trigger translational repression. MicroRNA-binding sites are found in the mRNA protein-coding region and even in the 5'UTR. However, most of the functional microRNA target sites are positioned within the mRNA 3'UTR, whose impact on the fine-tuned regulation of gene expression is still to be elucidated. Using the original software tools, we analyzed the location of the predicted microRNA-binding sites within the 3'UTRs of about 4000 human mRNA sequences retrieved from the *TargetScanHuman* 8.0 (7- and 8mers sites) and NCBI (6mers sites) databases. We found a very strong correlation between the length of the 3'UTR sequence and the density of homologous (repeated) microRNA-binding sites, whereas the regular sites were characterized by the inverse correlation between the 3'UTR length and the site density. Sorting the genes into the groups according to their 3'UTR length (in increments of 400 bases) revealed the statistically significant difference in microRNA target site densities between the neighboring datasets for both the regular and homologous sites. Furthermore, we observed the statistically significant difference between the homologous microRNA target site density in oncogenes and tumor suppressor genes with the 3'UTR length of 6401-7200 nucleotides. The results suggest the selection pressure on the microRNA target site distribution along the 3'UTR and the functional importance of homologous microRNA-binding sites. The differences in the positioning of the homologous microRNA target sites in oncogenes and tumor-suppressor genes with the long 3'UTRs ought to be further studied in human pathology.

Social Sciences And Humanities

149. Revolutionizing Cancer Supportive Care: Evidence-Based Impact of Integrated Support Services on Patient Quality of Life - The Dar Zhor Model from Morocco (2024-2025)

Wassila Benkirane

Sidi Mohamed Ben Abdellah University, Faculty of Letters and Human Sciences Dhar El Mehraz, Fez-Morocco

The implementation of Morocco's National Cancer Prevention and Control Plan (2020-2029) has created favorable conditions for developing supportive cancer care. Although medical coverage has progressed, the integration of supportive care into standard treatment protocols remains limited. This study evaluated the impact of supportive care services provided by Dar Zhor, a pioneering Moroccan patient association offering an integrated program of 41 supportive care activities.
Through a mixed-methods approach combining quantitative surveys and qualitative interviews, we assessed the experiences of a significant sample of beneficiaries. The study population predominantly comprised women aged 41-60 years, mostly married, with family histories of cancer, and primarily diagnosed with breast cancer. The comprehensive support services included physical activities, psychological support groups, complementary therapies, nutritional counseling, and aesthetic care. Preliminary quantitative analysis revealed significant positive impacts across multiple dimensions: physically, patients reported pain reduction, increased energy levels, and enhanced autonomy; psychologically, they experienced substantial decreases in anxiety and depression, alongside improved self-esteem and confidence. Additionally, patients reported better management of treatment side effects and improved body image perception. Social impacts included enhanced friendship bonds and reduced isolation, while family relationships remained stable. Initial patient satisfaction rates were remarkably high, with the majority of participants expressing high levels of satisfaction. Qualitative findings highlighted recommendations for service improvement, including geographical expansion, extended care duration, and enhanced psychological support.
The model's success of Dar Zhor is considered as a pioneering framework for integrated supportive cancer care in Morocco, demonstrating significant improvements in patients' physical, psychological, and social well-being. The evidence-based results validate that comprehensive supportive care is not a luxury but an essential component of cancer treatment, revolutionizing traditional approaches to patient care. These findings underscore the transformative potential of integrated supportive care in optimizing treatment experiences and overall quality of life for cancer patients in Morocco and beyond.

Keywords: supportive care, cancer, patient, quality of life, model.

Health and Medicine

150. **The relationship between body mass index and dysmenorrhea among adolescent female students at School of Nursing and Midwifery

Suleiman Umar Jah

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Introduction
Dysmenorrhea, or painful menstruation, is a prevalent health issue among adolescent females, affecting their daily activities and overall well-being. Numerous factors, including Body Mass Index (BMI), have been suggested to influence the severity and frequency of dysmenorrhea. This study investigates the association between BMI and the occurrence of dysmenorrhea among female adolescent students in Maiduguri, Borno State, Nigeria.
Objectives
The primary objective of this study is to evaluate the relationship between BMI and the severity of dysmenorrhea. Specifically, the study seeks to:
Examine the prevalence of dysmenorrhea across different BMI categories (underweight, normal weight, overweight/obese).
Analyze menstrual patterns, including cycle length and duration of blood flow, in relation to BMI.
Methods
A cross-sectional study was conducted between February and September 2014. The study population consisted of 120 female adolescent students, aged 15 to 26 years, from the School of Nursing and Midwifery in Maiduguri. Participants were selected using a convenience sampling technique. Data were collected through self-administered questionnaires, which included variables such as class age, menstrual pattern, severity of dysmenorrhea, and duration of blood flow. Participants' height and weight were measured using a standardized scale, and BMI was calculated. The severity of dysmenorrhea was categorized into mild, moderate, and severe based on the participants' self-reports.
Results
The study revealed the following key findings:

- Underweight Participants: Only 7.5% of underweight participants experienced moderate dysmenorrhea, with very few reporting severe dysmenorrhea (1.7%).

- Normal Weight Participants: Among participants with average BMI, 35.8% reported moderate dysmenorrhea, and a similar percentage reported having normal menstrual cycle lengths (26-29 days). Most of these participants had menstrual flows lasting 3-7 days.
- Overweight/Obese Participants: Participants in the overweight category were found to have a higher prevalence of mild dysmenorrhea, with 43.6% experiencing normal cycle lengths.
- Age Correlation: Participants aged 18-20 had the highest average BMI (21.05 kg/m²) and a higher prevalence of moderate to severe dysmenorrhea. In contrast, the younger age group (15-17 years) had the lowest dysmenorrhea prevalence (5% for severe cases).

Conclusion

The findings indicate a significant relationship between BMI and the severity of dysmenorrhea. Participants with average BMI reported a higher prevalence of moderate dysmenorrhea, while both underweight and overweight participants had lower instances of severe dysmenorrhea. These results suggest that BMI is an important factor influencing dysmenorrhea severity and menstrual patterns among adolescent females. Further research and targeted interventions could help in managing dysmenorrhea among students with varying BMIs.

Physical and Life Sciences

151.*Identification and Analysis of Oral Bacterial Isolates via Culturomics Approach

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A better understanding of intra-species diversity in the oral microbiome and strain-level associations with oral disease is needed. We aimed to create a subject- specific collection of cultivated isolates to facilitate future strain-level analysis of the oral microbiome. To achieve this, subgingival plaque was obtained from three different subjects and cultivated on eight different media in either anaerobic or aerobic conditions. 861 isolates comprising 103 species were obtained. All media and conditions tested appear necessary to capture a broad range of diversity. This culturomics- based approach recovers a large number of species and will be further employed to enhance the number of subject-specific collections of isolates, which will be genomically and phenotypically characterized in the future.

152.**Preliminary Results of Acoustic Surveys at the Cahaba Biodiversity Center in Bibb County, Alabama

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The Cahaba Biodiversity Center in Bibb County, Alabama, is a 2,100-acre property on 4 miles of the Cahaba River that was donated to the University of West Alabama in 2019. The Cahaba River is recognized by the World Wildlife Fund and Nature Conservancy as one of the world's biodiversity hotspots, therefore the center serves as potential habitat for many native species. No extensive surveys of bats have been conducted on the property to date, though at least one hibernaculum is suspected on the property and several species are endangered in Alabama. We are conducting standard acoustic survey methods for detecting bats from March 2024 through March 2025 in order to provide CBC managers with initial data on bat diversity and habitat use while providing recommendations on future survey periods and habitats. We are using Song Meter Mini Bat Ultra Sonic Recorders (Wildlife Acoustics) on a 2-day on/2-day off survey period to conserve battery and SD card space while capturing all four seasons. All bats reliably identified to species are summarized by season and survey site. To determine the optimum season and habitat association for detecting foraging bats overall and by species at the CBC, acoustic data to date is analyzed across all four seasons (Spring, Summer, Fall, and Winter) and various habitat characteristics, including foraging habitat type (open field, open water, thinned forest), proximity to water source, and travel corridor type (main or side road).

153.**FT-IR and DOSY NMR for Poly(γ-benzyl-L-glutamate) at Low Molecular Weight

Leah Johnson

The University of Alabama in Huntsville

Poly(amino acids), such as poly(γ-benzyl-L-glutamate) (PBLG) are researched for biomedical applications including drug and gene delivery, biomedical engineering and their self-assembly capabilities. Thorough physical investigations of poly(amino acid)s can lead to the development of a set of complementary characterization methods. PBLG was synthesized by ring opening polymerization of the corresponding benzyl-L-glutamate N-carboxyanhydride initiated by a primary amine resulting in short chain PBLGs with degrees of polymerization (DP) ranging between 10 and 50. These low molecular weight polymers were chosen because they are best suited for the development and evaluation of absorbance (FT-IR) behavior and molecular weight determination by diffusion ordered NMR spectroscopy (DOSY NMR). Direct determination of molecular weight using FT-IR has not been established for polymers. However, it was found here that IR absorption may be considered for determining PBLG molecular weight. Using statistical methods such as Spearman's ρ, the relationship between the number of repeat units and IR absorption was investigated for low molecular weight PBLGs (< 12,000 g/mol) in solution (chloroform). Most notably, absorbance increased as the number of repeat units increased and most accurately followed an exponential function in chloroform. Additionally, viscosity studies were used to investigate the unusual clustering of PBLG absorbances data between 30 and 40 repeat units in chloroform and was interpreted as the entanglement point. The DOSY NMR characterization of PBLG was investigated to determine appropriate instrumental practices and a mathematical description for determining the molecular weight of PBLG at low DPs. Three possible mathematical routes were investigated: a small molecule model, power law fit, and a standard comparison. A power law relation between the diffusion coefficient and molecular weight was found to be the best fit for PBLG (<12,000 g/mol).

154.**Understanding the role of dark septate endophytes in salinity tolerance and pathogen protection of Spartina alterniflora

Camille Thompson and Jeremiah Henning

Biology Department at the University of South Alabama

Dark septate endophytes (DSE) are globally ubiquitous fungal symbionts that colonize plant roots and contribute to stress tolerance of their host. In coastal habitats, DSE confer salinity tolerance, provide access to nitrogen and phosphorous, and contribute to pathogen resistance in salt marsh grasses; however, strains likely differ in their ability to perform these functions. My project will isolate and identify DSE strains from coastal marshes around Dauphin Island, AL, and test their ability to confer salinity tolerance and pathogen protection to host Spartina alterniflora. To determine the salinity tolerance of isolated strains, we will grow each strain on agar media ranging from 0 to 40 ppt salt and measure the strains' growth rate and survival. To test the ability of strains to provide pathogen resistance, we will inoculate Spartina alterniflora with DSE strains, then challenge our plants with common root pathogen Fusarium to evaluate the effects on survival and growth of S. alterniflora. I predict that DSE strains collected from high-salinity sites will have higher growth rates in high salt than those collected in low-salinity sites. The pathogen Fusarium will reduce survivorship in uninoculated S. alterniflora. However, DSE strains should improve survival, and we can quantify differences between inoculated and uninoculated S. alterniflora. Our project seeks to explore DSE strains that can be implemented in coastal restoration to improve the resilience to match future salinity increases due to coastal drought and increased pathogen spread due to changing climate. Although understudied in the restoration context, my research will provide insight into the feasibility of DSE in coastal marsh restoration practices.

155.**Physiological and morphological traits vary in their response to recovery after exposure to constant light in the zebra finch

Kevin Pham

Auburn University

A unifying framework integrating environmental variation, physiological stress mediators, and physiological costs with fitness outcomes will be critical in a world experiencing rapid environmental change. The Damage-Fitness model describes how stress is linked to damage and repair pathways that drive health and fitness outcomes across biological taxa. However, we lack an understanding of how variation in hypothalamic-pituitary-adrenal (HPA) responses affects damage, especially after recovery from stressors. In this study, adult female zebra finches were exposed to a normal photoperiod or constant light for 23 days followed by a recovery period. We tracked changes in body mass, circulating glucocorticoid hormone and blood glucose levels at baseline and after a standardized restraint protocol, and DNA damage in the red blood cells. We also measured liver glucocorticoid receptor protein abundance at the end of the experiment. We found that constant light increased body mass and decreased baseline glucose levels over the duration of the experiment, however a 12-day recovery period reversed the effects of constant light, indicating stress resilience. In contrast, the glucose stress response (post-restraint – baseline glucose levels) did not show a similar recovery trend. Interestingly, there were no differences in baseline or post-restraint glucocorticoids levels, protein expression of glucocorticoid receptors, or DNA damage between groups. Using path analysis, we built models to identify causality and covariation among our variables. We found that HPA axis reactivity (post-restraint –baseline levels of glucocorticoids) was positively associated with the glucose stress response, and this mediated a positive relationship with DNA damage in the red blood cells in control birds. However, this relationship was lost in birds recovering from constant light, suggesting an uncoupling between these traits within the physiological regulatory network. These patterns indicate that long-term exposure to a stressor such as constant light can alter biologically linked relationships, even after cessation of that stressor.

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