Peers Alley Media
1126 59 Ave East, V5X 1Y9, Vancouver BC, Canada
WhatsApp No: +1 (873) 371-5878

JOINT EVENT

FUTURE OF BIOSENSORS AND BIOELECTRONICS

ADVANCES IN STRUCTURAL BIOLOGY AND PROTEIN CHEMISTRY

June 20-21, 2024 | BARCELONA, SPAIN

PEERS ALLEY MEDIA

PROGRAM-AT-A-GLANCE >>

YOUR FIRST CHOICE FOR RESEARCH INGENUITY

FUTURE OF BSBE 2024 & ADV. STRUCTURAL BIO 2024

DAY 1
JUNE 20, 2024

Scientific Program

08:00-08:30	**Registrations**
08:30-08:40	**Opening Ceremony**
Moderator	**Elena G. Tolkacheva,** *University of Minnesota, USA*
Chair	**Jordi Marti,** *Polytechnic University of Catalonia-Barcelona Tech, Spain*

Topics: Biosensors and Bioelectronics | Biosensors Design and Fabrication | Medical Applications of Biosensors | Intelligent and Biosensors | Molecular Biology | Advancements in Structural Biology | Protein Engineering | Cell Biology | Structural Bioinformatics

Introduction

Distinguished Speaker Talks

08:40-09:00	**Title: Electronic Muscle Stimulation Jumpsuit Optimization: Conductivity, textiles and performance** **Mary Ruppert-Stroescu,** *Washington University in St. Louis, USA*
09:00-09:20	**Title: Silicon-based acoustic biosensors for cardiac monitoring** **Stephen F. Bart,** *TDK, Boston, USA*
09:20-09:40	**Title: Correlation between AF active sites and the anatomy hallmarks before and after pulmonary vein isolation** **Tolkacheva E. G,** *University of Minnesota, USA*
09:40-10:00	**Title: Synergistic advancements: Integration of artificial intelligence and machine learning in biosensors and bioelectronics** **Koffka Khan,** *The University of the West Indies, West Indies*
10:00-10:20	**Title: Developing an electrochemical non-enzymatic biosensor based on PdNPs/carbon dots/silica hybrid nanostructure** **Thiago Canevari,** *Mackenzie Presbyterian University, Brazil*
10:20-10:40	**Title: Molecular basis of prokaryotic cyclic glucan biosynthesis** **Dongchun Ni,** *IPHYS, SB, EPFL, Switzerland*

Group Photo 10:40-10:45

Refreshment Break 10:45-11:00

11:00-11:20	**Title: New reflections on the motive power of fire** **Claudio Zamitti Mammana,** *University of Sao Paulo, Brazil*
11:20-11:40	**Title: His-tagged micelles as a potential tool for crystallization of membrane-proteins** **Guy Patchornik,** *Ariel University, Israel*
11:40-12:00	**Title: Molecular dynamics simulations of RAS oncogenes: Locating and targeting dynamical drugging pockets** **Jordi Marti,** *Polytechnic University of Catalonia-Barcelona Tech, Spain*
12:00-12:20	**Title: Treatment of Osgood-Schlatter disease in an adolescent athlete with liquid platelet-rich fibrin and heat-coagulated albumin gel: A case report** **Torbjörn Ogéus,** *Stockholms led- & smärtklinik, Sweden*
12:20-12:40	**Title: Dendritic crystal formation and growth of biological solutions and its AI aided image analysis for medical applications** **Yao-Xiong Huang,** *Jinan University, China*
12:40-13:00	**Title: Development of electroactive materials/surfaces for biosensors and biomedical applications** **Jean-Manuel RAIMUNDO,** *Aix Marseille Université, France*

Group Photo 13:00-13:05

Lunch Break 13:05-13:50

13:50-14:10	**Title: Understanding genotoxicity of airway epithelium exposed to environmental mold** **Joyce Chen,** *University of Chicago, USA*
14:10-14:40	**Title: Regulation of mTOR by phosphatidic acid** **Maria A Frias,** *St. Francis College, USA*
14:40-15:00	**Title: Printed liquid metal electronics for wearable applications** **Jianliang Xiao,** *University of Colorado Boulder, USA*
15:00-15:20	**Title: Smartphone-enabled devices for dynamic analysis of biofluid samples at the point of care** **Hatice Ceylan Koydemir,** *Texas A&M University, USA*

15:20-15:40	**Title: The future of biosensors and bioelectronics: Time to consider broader ethical issues in the use of wearable biosensors in smartwatches** **Okechukwu Ethelbert Amah,** *Pan-Atlantic University, Nigeria*
15:40-16:00	**Title: Understanding the effect on the state of health of a lithium-ion battery caused by charging at a high current rate** **Andres Valverde Saborio,** *University of Costa Rica, Costa Rica*

Refreshment Break 16:00-16:15

16:15-16:35	**Title: Transcriptome analysis of wheat leaves in response to drought stress** **Irada Huseynova,** *Ministry of Science and Education of the Republic of Azerbaijan, Azerbaijan*
16:35-16:55	**Title: Evaluation of postmortem changes in tooth enamel and pulp by micro CT to determine the postmortem interval** **Selcuk Cetin,** *Tokat Gaziosmanpasa University, Turkey*
16:55-17:15	**Title: Microfluidic sliding paper-based device for point-of-care determination of albumin-to-creatine ratio in human urine** **Szu-Jui "Ray" Chen,** *National Cheng Kung University, Taiwan*
17:15-17:35	**Title: A smart thermoresponsive macroporous 4D structure by 4D printing of Pickering emulsions stabilized by plasma-functionalized starch nanomaterials for a possible delivery system** **Mahdiyar Shahbazi,** *University of Natural Resources and Life Sciences (BOKU), Austria*
17:35-17:55	**Title: A novel biosensor based on corn tassel polyphenol oxidase for detection of dopamine** **Reyhan Gül Güven,** *Dicle University, Turkey*
17:55-18:15	**Title: Bacterial nitroreductases as prodrug-activating enzyme for cancer gene therapy and for biosensoring the pollutants** **Kemal GUVEN,** *Dicle University, Turkey*
18:15-18:35	**Title: Effects of edible alginate coating enriched with organic acids on quality of mango fruit during storage** **Rasoul Etemadipoor,** *University of Hormozgan, Iran*

18:35-18:55	**Title: Nylon nanofibres as an antibody immobilisation surface in a biosensor device: Study of their reusability and stability** **Ines Peraile Muñoz,** *National Institute for Aerospace Technology "Esteban Terradas" (INTA)-Campus La Marañosa, Spain*
18:55-19:15	**Title: Sensors used for tracking racing greyhound stride length and frequency** **David Eager,** *University of Technology Sydney, Australia*
19:15-19:35	**Title: Highly selective THC detection based on molecularly imprinted polymers** **Mina Hoorfar,** *University of Victoria, Canada*
19:35-19:55	**Title: Non-Invasive diagnosis method for cutaneous leishmaniasis with high specificity and sensitivity** **Yasaman Taslimi,** *Pasteur Institute of Iran, Iran*
19:55-20:10	**Title: A novel microfluidic paper-based analysis system for determining Blood Urea Nitrogen** **Chien-Hsuan Ko,** *National Cheng Kung University, Taiwan*

Panel Discussion

End of Day 1

DAY 2
JUNE 21, 2024

Scientific Program

09:45-10:00	**Opening Ceremony**

Topics: Biosensors and Bioelectronics | Biosensors Design and Fabrication | Medical Applications of Biosensors | Intelligent and Biosensors | Molecular Biology | Advances in Structural Biology | Protein Engineering | Cell Biology | Structural Bioinformatics

Introduction

Distinguished Speaker Talks

10:00-10:20	**Title: From intelligent sensors to digital twin for healthcare** **Xueji Zhang,** *Shenzhen University, China*
10:20-10:40	**Title: Characterization of Alginate–Gelatin–Cholesteryl Ester Liquid Crystals bioinks for extrusion bioprinting of tissue engineering scaffolds** **Alyaa Idrees Abdulmaged,** *Universiti Tun Hussein Onn Malaysia, Malaysia*
10:40-11:00	**Title: Magnetoelectric nanorobots for magnetically assisted cell targeting, electroporation and on-demand drug delivery** **Soutik Betal,** *Indian Institute of Technology Delhi, India*
11:00-11:20	**Title: Health risk assessment of exposure to Benzene, Toluene, Ethylbenzene and Xylenes in a vehicle manufacturing industry in Iran** **Sina Sadeghi Amin,** *University of Tehran, Iran*
11:20-11:40	**Title: Diving into the depths: Exploring underwater electronic sensor technology** **Pooja Prasenan,** *Cochin University of Science and Technology, India*

Panel Discussion

End of Day 2

DAY 2

JUNE 21, 2024

Scientific Program

Exclusively for Virtual Speakers

Virtual Presentations Conducted through CISCO Webex

PEERS ALLEY MEDIA

DISTINGUISHED SPEAKER TALKS

DAY 1

Joint Event

Future of Biosensors and Bioelectronics

&

Advances in Structural Biology and Protein Chemistry

June 20-21, 2024
Barcelona, Spain

FUTURE OF BSBE 2024 &
ADV. STRUCTURAL BIO 2024

Electronic Muscle Stimulation Jumpsuit Optimization: Conductivity, textiles and performance

Ruppert-Stroescu[1] and **M. Cohen**[2]

[1]Washington University in St. Louis, USA
[2]Stars Design Group, USA

Electronic Muscle Stimulation (EMS) via wearable electronic textile-based systems have the potential to transform human performance. Textile-based EMS systems are gaining interest in the academic and commercial domains of sports performance, occupational therapy, remote monitoring and more, yet the quality and consistency of the EMS garments commercially available varies greatly and standards for wearable electronic textile-based systems are emerging but not yet comprehensive. To contribute to the body of knowledge concerning EMS garments, the objectives of this study were to assess the performance of a commercially available EMS suit, to optimize the EMS suit's functionality and to determine a framework that will aid in assuring quality when manufacturing an EMS suit at scale.

An experimental study evaluated fifteen jumpsuits for electronic, ergonomic and body fit both in the lab and on human subjects. This thorough analysis of a) stimulation efficacy positioned in ten distinct locations on the body, evaluation of b) conductive paths, c) conductive threads d) connectors, e) battery packs and f) application interfaces resulted in a model of design criteria for an optimized production-ready EMS jumpsuit. Results of this study provide sport trainers and therapists, as well as manufacturers of EMS textiles, with a baseline for assuring the performance of textile-based EMS products.

Biography

Mary Ruppert-Stroescu is an Associate Professor at Washington University in St. Louis. She earned her PhD in Human Environmental Sciences from the University of Missouri. Her dissertation research resulted in the "Typology for Creativity in Fashion Design and Development," a framework for understanding diverse aspects of creativity for fashion design.

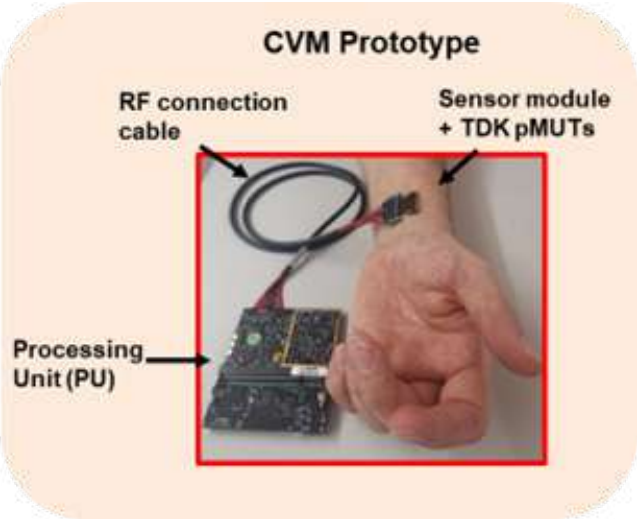
Her research focuses on the study and application of creativity, particularly through the exploration of sustainable fashion design and production, as well as interdisciplinary collaborations with engineers and medical scientists on wearable electronic textile-based sensing systems that address health and wellbeing. Ruppert-Stroescu has numerous peer-reviewed publications and has given research presentations and exhibited her creative scholarship at conferences internationally. She holds intellectual property protection for four inventions, including a patent for “Textile repurposing and sustainable garment design.” Most recently, she spoke a TEDx St. Louis event.

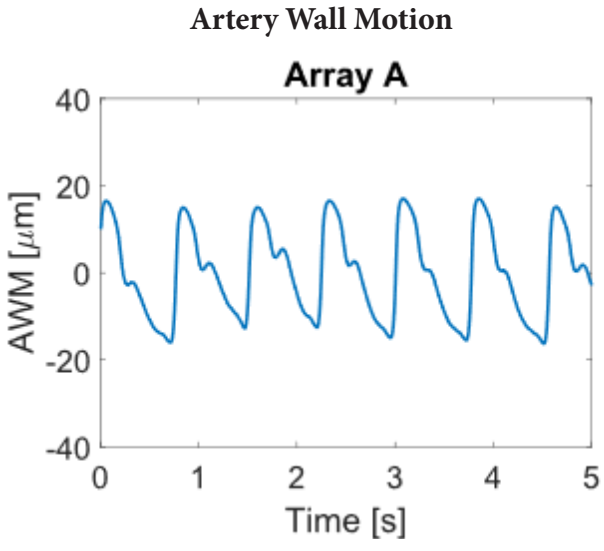
Silicon-based acoustic biosensors for cardiac monitoring

Stephen Bart[1], Leonardo Baldasarre[2] and **Peter Hartwell[3]**

[1]TDK, Boston, USA
[2]TDK-Invensense, Milan, Italy
[3]TDK, San Jose, USA

Sensor technology is becoming increasingly sophisticated, affordable and ubiquitous. Sensors are becoming the human interface to the digital world and, when combined with machine learning (ML), make systems or devices more aware of what the human body is doing, about to do, or has just done. In this talk, we will demonstrate a system, based on miniaturized ultrasonic sensors, that can measure in real time a number of cardiovascular biomarkers, such as the pulse waveform, artery wall motion, pulse wave velocity and blood pressure. This system is non-invasive and easily wearable, thus has the opportunity to disappear into the background, allowing patients to track their internal health and well-being easily.





Biography

Dr. Bart received the B.S., M.S. and Ph.D. degrees from the Massachusetts Institute of Technology, Cambridge, Massachusetts. He did his doctoral research regarding the analysis and design of the first microfabricated electrostatic motors and pumps. After his PhD work, Dr. Bart joined Analog Devices, Inc., where he designed the MEMS sensor in the well-known Analog Devices, Inc. ADXL150 family of airbag accelerometers, which has over 500 million sensors in the field. From 1996 to 2002 he held several positions at Coventor, Inc., a developer of physical design tools for MEMS systems. Dr. Bart returned to Analog Devices as a Senior Product Development Leader, working on inertial MEMS sensors for the commercial marketplace. Today, Dr. Bart leads the Advanced Technology group at TDK, where he is developing advanced gas sensors, ultrasonic and acoustic sensors for biomedical applications and advanced machine learning systems. Dr. Bart's research interests include the design, modeling and simulation of complex electromechanical systems and Machine Learning methods for sensor data fusion. Dr. Bart holds 11 patents in the microsystems area.

Correlation between AF active sites and the anatomy hallmarks before and after pulmonary vein isolation

Elena G. Tolkacheva

University of Minnesota, USA

Cardiac mapping and ablation are critical in managing atrial fibrillation (AF), the most common cardiac arrhythmia. However, pulmonary veins (PV) isolation as ablation approach is limited with persistent AF cases and ablation beyond PVs may be necessary due to atrial remodelling and additional AF active sites. Therefore, it is important to develop approaches for accurately identifying potential ablation sites in atria for improving AF management therapy. The aim of our study was to identify and visualize potential AF active sites by implementing our innovative similarity score methods in a clinical setting using bipolar intracardiac electrograms (iEGMs) recorded from swine models (n=4) during AF. Results of iEGMs analysis and active AF sites were then correlated with clinically established anatomical hallmarks of the left atria (LA). We demonstrated that AF active sites are distributed across a range of anatomical hallmarks, including both within and outside the PV regions. Our findings indicate that at the baseline AF, active AF sites were identified both within and outside the PV regions using the validated similarity score method. While PVI was effective in eliminating active sites within the PV regions, active AF sites persisted in non-PV regions. A significant transition of active sites from both PV and non-PV regions to primarily the roof wall in the Post PVI stage was observed, highlighting the need for further research to understand this phenomenon. The insights gained from this shift in AF active sites on post-PVI will be instrumental in refining our approaches to AF treatment, particularly in cases where conventional PVI techniques prove inadequate.

Biography

Elena Tolkacheva obtained MS in Theoretical Physics from Belarussian State University and PhD in Laser Physics from Nice University, France. She also received postdoctoral trainings in cardiac electrophysiology from Duke University and SUNY Upstate Medical University, USA. At present, she is a Professor of Biomedical Engineering at the University of Minnesota. Her laboratory is interested in understanding the electrical activity of the whole heart, aiming to reveal mechanisms of complex cardiac rhythms leading to fibrillation and subsequently, to sudden cardiac death. She is the author and co-author of over 60 publications, over 100 conference presentations, has several patents and serves on editorial boards of 5 journals.

Synergistic advancements: Integration of artificial intelligence and machine learning in biosensors and bioelectronics

Koffka. Khan

Department of Computing and Information Technology, The University of the West Indies, West Indies

The integration of Artificial Intelligence (AI) and Machine Learning (ML) techniques into biosensors and bioelectronics has ushered in a transformative era in the fields of healthcare, biotechnology and environmental monitoring. This discussion explores the symbiotic relationship between AI/ML and biosensing technologies, highlighting their collaborative potential in enhancing sensitivity, accuracy and real-time data analysis.

Biosensors, traditionally reliant on biochemical recognition elements, have greatly benefited from AI-driven data processing. Machine Learning algorithms enable rapid, automated data interpretation, enabling biosensors to detect and quantify analytes with unprecedented precision. Moreover, AI has facilitated the development of self-calibrating biosensors, reducing the need for constant recalibration and maintenance.

Bioelectronics, on the other hand, have leveraged AI for signal amplification and noise reduction. Neural networks and deep learning algorithms have been pivotal in deciphering complex electrochemical and physiological signals, paving the way for novel diagnostic tools and therapeutic interventions. AI-driven bioelectronic devices have been particularly impactful in personalized medicine, where they enable tailored treatment strategies based on real-time patient data.

Furthermore, AI and ML have revolutionized sensor design and optimization. Generative algorithms can rapidly explore a vast design space, leading to the creation of highly sensitive and specific biosensors. Additionally, AI-powered simulation and modeling have streamlined the prototyping process, accelerating the development of next-generation biosensing technologies.

In conclusion, the integration of AI and ML into biosensors and bioelectronics represents a

powerful synergy that promises to reshape healthcare, environmental monitoring and beyond. The collaborative efforts of these fields hold immense potential for early disease detection, personalized medicine and sustainable resource management, offering a brighter future for human health and the environment.

Biography

Koffka Khan received the B.Sc., M.Sc., M.Phil. and D.Phil. degrees from the University of the West Indies. He is currently a Lecturer at the UWI and has up-to-date, published over 170 books, journal and conference papers in proceedings of international repute. His research areas are Artificial Intelligence, Optimization, Distributed Computing, Computational Intelligence, Machine Learning and Network Security.

Developing an electrochemical non-enzymatic biosensor based on PdNPs/carbon dots/silica hybrid nanostructure

Thiago C Canevari and **Joao H. A. Ferreira**

LabNaHm: Multifunctional Hybrid Nanomaterials Laboratory Engineering School, Mackenzie Presbyterian University, Brazil

The hybrid nanostructures formed by PdNPs/Carbon dots/Silica were prepared in a single step, without external catalysts, by mixing TEOS with PdNPs/Cdots, where the Cdots have been previously prepared by electrochemical means using n-propanol as carbon source. Palladium nanoparticles (PdNPs) containing Cdots (PdNPs-Cdots) were prepared from the palladium chloride complex $Na_2[PdCl_4]$. The printed carbon electrode, CSE, was used as a working electrode, which had its surface modified by adding 60 uL of an aqueous solution of the PdNPs/Carbon dots/SiO_2 nanostructure. The CSE/PdNPs/Carbon dots/SiO_2 electrode showed an excellent electrocatalytic response for the simultaneous determination of dopamine and serotonin in the presence of AA, as shown in figure 1, in which the electrocatalytic current increased, I, proportionally in function of the increase concentration, for both species. Measurements were performed differential pulse voltammetry in PBS, pH 7.0, in the presence of ascorbic acid, with the attention fixed at 1×10^{-4} mol/l and concentrations of dopamine and serotonin ranging from 5×10^{-7} to 7×10^{-6} mol/L. The detection limits were 36 nmol L^{-1} of dopamine and 33 nmol L^{-1} of serotonin.

Biography

Thiago C Canevari graduated with a bachelor's degree in Technological options from the State University of Londrina, a Master's in Inorganic Chemistry and a Doctorate in Materials Chemistry from the State University of Campinas. He has two postdoctoral internships at the University of São Paulo in nanotechnology. Leader of the research group, consolidated by CNPq, called Multifunctional Hybrid Nanomaterials (NaHM). He works mainly on the following topics: electrocatalysis, (Bio) electrochemical sensors, multifunctional hybrid nanomaterials, filtering nanomembranes and the sol-gel process. He is currently a professor in the chemistry course and the Materials and Nanotechnology Engineering postgraduate program at Universidade Presbiteriana Mackenzie.

Molecular basis of prokaryotic cyclic glucan biosynthesis

Dongchun Ni, Babatunde Ekundayo and **Henning Stahlberg**

Laboratory of Biological Electron Microscopy, IPHYS, SB, EPFL and Dept. Fundamental Microbiology, Faculty of Biology and Medicine, UNIL, Switzerland

The biosynthesis of complex sugars represents a pivotal issue in microbial biology. Cyclic β-1,2-glucan (CβG) is a polysaccharide crucial for host interactions in various bacteria, including the significant human pathogen Brucella and the major plant pathogen Agrobacterium. CβG is synthesized by cyclic glucan synthases (Cgs) and transported from the intracellular space to the periplasmic space by cyclic glucan transport proteins (Cgt). Using techniques such as cryo-electron microscopy (cryo-EM) and biochemical assays, I explored the structure and function of Cgs from A. tumefaciens and the Cgt protein from Brucella abortus. We determined the intricate structure of these two complex protein machines and elucidated critical aspects of CβG synthesis and transport, uncovering a unique mechanism involving tyrosine-linked oligosaccharide intermediates in the glucan chain polymerization and processing cycle. Our research paves the way for novel strategies to combat pathogens that depend on polysaccharide virulence factors and may lead to synthetic biology methods for producing complex cyclic sugars.

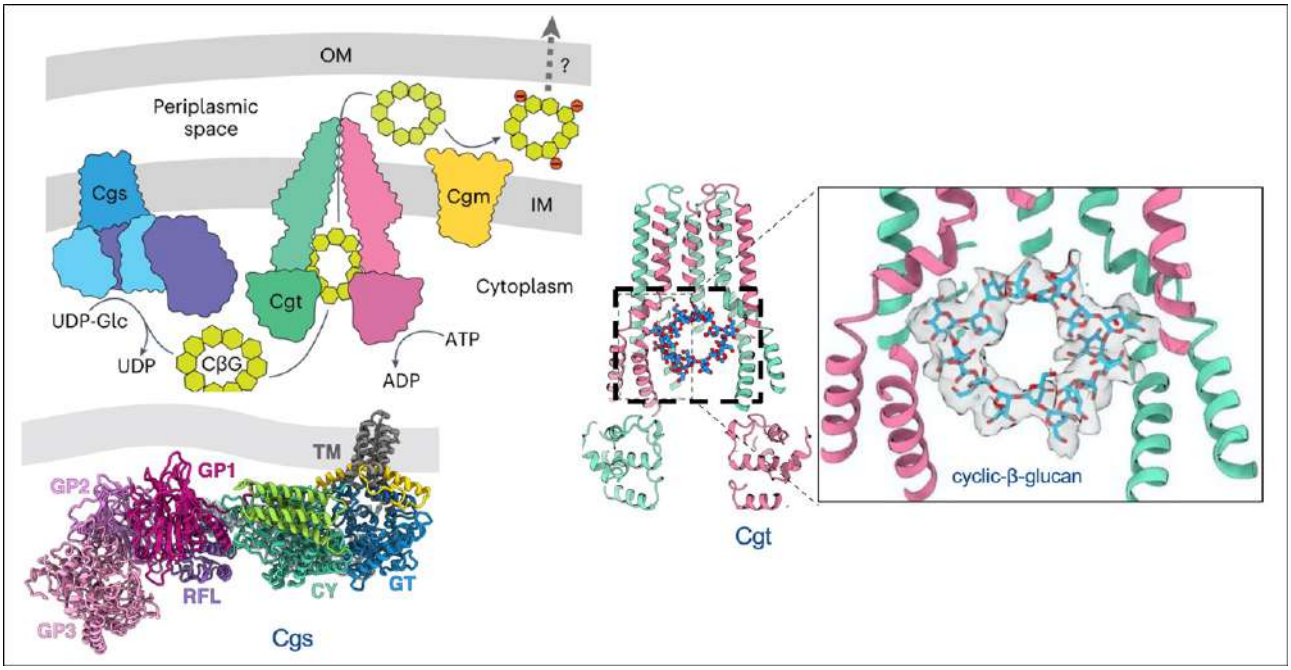


Figure 1 CβG synthesis pathway. Cgs is responsible for the generation of the main glucan backbone, which is exported across the inner membrane (IM) by Cgt. In the periplasm, Cgm adds negatively charged side chains to the glucan. OM, outer membrane.

Biography

Dongchun Ni joined Prof. Henning Stahlberg's lab at the University of Basel as a PhD student in December 2017. Since then, he has had the great opportunity to contribute to one of the projects of the NCCR TransCure. He is applying high-resolution cryo-electron microscopy to unravel the 3D structure of proteins and understand their biological function and involvement in diseases. Dongchun Ni is currently a postdoctoral researcher at the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, focusing on prokaryotes. His research particularly addresses the molecular basis of virulence factors in pathogenic bacteria related to diseases and the development of potential anti-infective drugs.

New reflections on the motive power of fire

Claudio Zamitti Mammana

Institute of Physics, University of Sao Paulo, Brazil

In this presentation I intend to expose the necessary modifications in the Kinetic Theory of Gases, in Statistical Mechanics and in the foundations of Quantum Mechanics, to obtain a version of Quantum Theory that conforms both with Thermodynamics and Special Relativity. It allows derive the thermodynamic properties of a chemical substance in the vapor state, expressed in terms of a hypothetical substance, called Perfect Vapor that appropriately describe the fundamental properties of Carnot's working substance.

In summary I intend to show:

1	... that the variations of the entropy of a chemical substance under the action of heat are elementary relativistic processes.
2	... how to obtain the equation of state of the Carnot's Working Substance
3	... that the anti-commutative rule of the degrees of freedom of the quantum variables derives from relativity
4	... that the energy of Classical Thermodynamics is an imaginary quantity.
5	... that the interpretation of Planck constant given by A. Sommerfeld supercedes the Third Law of Thermodynamics
6	... a new explanation of the Bose-Einstein condensation;
7	... that the asymmetry of time is the result of the persistent action of the elementary processes of absorption and emission of photons.
8	... that the indistinguishability of particles and the exclusivity of Pauli are not intrinsic (ontological) characters of the particles but of thermodynamic equilibrium conditions.
9	... that the interpretation of the second law as the transition from order to chaos must be reviewed.

Biography

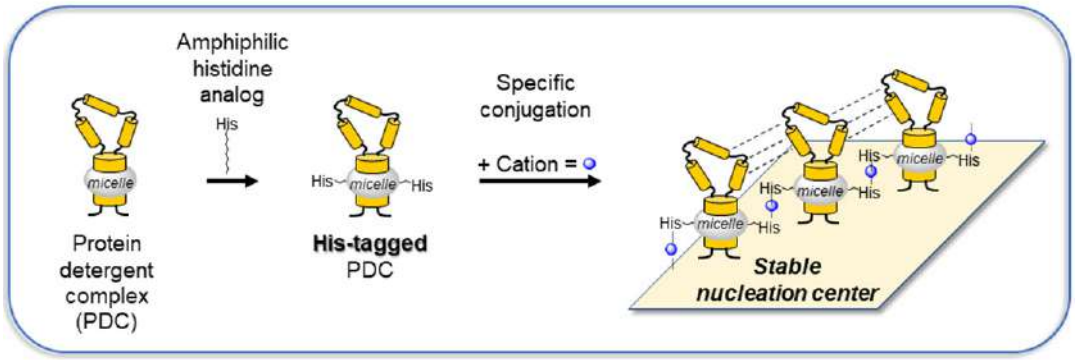
- Claudio Zamitti Mammana
- Mechanical Engineer: Instituto Tecnológico da Aeronáutica
- PhD in Electronic Engineering: Escola Politécnica, University of São Paulo
- President: Sociedade Brasileira da Computação
- Director of Technology, Elebra Informatica
- President: Associação Brasileira da Indústria de Computadores e Periféricos
- Associate Professor: Instituto de Física, Universidade de São Paulo

His-tagged micelles as a potential tool for crystallization of membrane-proteins

Guy Patchornik, M. Lal and **Troung T. V**

Ariel University, Israel

We present a new concept for crystallization of integral membrane proteins. Our working hypothesis relies on the assumption that by conjugating-micelles containing the target membrane protein, one would bring the latter into proximity and stabilize nucleation centers that would support crystal growth. Micellar conjugation is achieved with amphiphilic [metal:chelator] complexes generated at the micelle\water boundary. The binding affinity between the metal and the hydrophobic chelator used, defines the (i) strength of binding between: protein detergent complexes (PDCs) as well as (ii) the rate at which PDCs dissociate & reassociate until the most ordered PDCs assembly, is reached. Thus far, 3D crystals of two membrane proteins belonging to the retinal family were obtained *via* this approach, but these were either too small or too thin to allow structure determination. Therefore, ***His-tagged micelles*** are being developed as a potential alternative (see illustration).



Biography

Dr. Patchornik is an organic chemist who switched to biochemistry during his Ph.D. at the Weizmann Institute of Science, Israel. The challenge of developing a simple-to-implement and general method for directing integral membrane proteins to assemble into high quality 3D crystals is the focus of his research. Since 2009 he is a faculty member at the Chemical Sciences department at Ariel University, Israel.

Molecular dynamics simulations of RAS oncogenes: Locating and targeting dynamical drugging pockets

Jordi Marti[1], Zheyao Hu[1] and **Huixia Lu[1,2]**

[1]Department of Physics, Polytechnic University of Catalonia-Barcelona Tech, Spain
[2]Soft Matter Theory Group, Institut de Ciencia de Materials de Barcelona (ICMAB-CSIC), Spain

RAS proteins work as GDP–GTP binary switches regulating cytoplasmic signalling networks and playing an essential role in turning on genes involved in cell growth, differentiation and survival and participating in about 30% of all known cancers [1]. Identifying anti-RAS therapeutic strategies is crucial for cancer treatments, but still no general therapies have reached full clinical application [2]. One of the hardest challenges to face is that mutation-selective therapeutic strategies are needed [3]. In this talk, we will report results on mutated KRAS and NRAS proteins bound to GDP/GTP in aqueous solution and eventually attached to a cell membrane, obtained by molecular dynamics at the all-atom level [4]. Specific mechanisms of the binding of the GDP/GTP to RAS and individual drugging pockets have been identified. These pockets can be targeted by small-molecule compounds designed *in-silico* capable of promoting inactive states [5]. Finally, a new protocol (Isomer-Sourced Structural Iteration) intended to the systematic drug-design of new compounds will be introduced.

Biography

Jordi Martí is Full Professor of Physics at the Department of Physics of the Polytechnic University of Catalonia-Barcelona Tech. He got his PhD degree in Physics (summa cum laude) at the University of Barcelona. He has been a visitor at the University of California-Berkeley, the Lawrence Berkeley National Laboratory, the Hungarian Academy of Sciences and the National Commission of Atomic Energy of Argentina.

His present research interests include: molecular modelling and simulation of biological membranes, *in-silico* drug design for oncogenic proteins, helium nucleation in lithium and lead solutions and the development of machine learning based tools for the computation of partition functions.

He has published three books and 100+ international peer-reviewed papers with 4200+ citations and he has presented 70+ communications in international conferences. His Hirsch parameter is 41. He's a member of the editorial board of "Materials" and "Graphene". He has been a guest editor for the journal "Membranes".

Treatment of Osgood-Schlatter disease in an adolescent athlete with liquid platelet-rich fibrin and heat-coagulated albumin gel: A case report

T. Ogéus

Stockholms led- & smärtklinik, Sweden

Background: Knee pain is one of the most frequent musculoskeletal symptoms in young physically active males. In some cases, it is very painful, can be hard to treat and often leads to heterotopic ossification of the patellar tendon. To the best of our knowledge, there are no reported cases of remission of ossification after clinical intervention.

Case Presentation: A 13-year-old Swedish boy with a 3-year anamnesis of severe Osgood-Schlatter with significant ossification of the patellar tendon at the point of tuberositas tibiae, was treated with injections of liquid platelet-rich fibrin concentrated platelet rich fibrin and heat coagulated albumin platelet rich fibrin gel (ALB-PRF) using a horizontal centrifuge system. He recovered and presented a near complete remission of ossification of the patellar tendon 2 months after treatment and could return to sport after a 3-year break.

Conclusion: This case raises the hypothesis that liquid ALB-PRF gel may be an effective intervention in the treatment of Osgood Schlatter disease. Further research is required to test this theory.

Biography

Torbjörn is a pain specialist with extensive clinical experience in the field of regenerative medicine. His team was the first in Sweden to inject autologous growth factors to treat tendon and cartilage injuries in 2013. Since then, over 10.000 extra- and intra-articular treatments have been performed in his clinic.

In August 2019, his team performed Sweden's first autologous mesenchymal stem cell injection in a joint with Osteoarthritis. He has since then carried out over 200 successful stem cell injections.

His clinic has patients from all over the world flying in to receive treatments.

Before Torbjörn started studying medical subjects, he had a career as a professional athlete, playing handball in clubs all over Europe and the Champions League. An unsuccessful surgery of the knee led to osteoarthritis and ended his athletic career, but his personal experience served as a great starting point and motivation for his current clinical career.

Dendritic crystal formation and growth of biological solutions and its AI aided image analysis for medical applications

Yao-Xiong Huang

Department of Biomedical Engineering, Jinan University, China

The studies on the dendritic crystallization of biological solutions are significant for medical applications. This manuscript reports our systematic study on the solution dendritic crystallization as a function of temperature, pH value and the concentrations of its major components. And the factors that cause the variation in the crystal patterns, the distribution of the main components in the crystals and the sequence of their deposition or crystallization. By summarizing the general crystallization behaviour and formation mechanisms of biological solutions, we proposed the methods of crystal pattern analysis for the solution characteristics tests or growing the crystals with desired patterns for different purposes. By the methods, one can conduct a quantitative test on a solution by analysing its evaporated crystallization patterns. Therefore, the chemical compound measurements that usually need to use analytical instruments can be transferred to simple pattern recognition and analysis and make it become an objective test. With a smartphone-based portable imaging device, the crystal pattern analysis method can be a powerful means for daily use of medical and biochemical point-of-care testing (POCT). On this basis, we developed a simple smartphone-based salivary crystallization imaging system with functions of AI-aided rapid automatic pattern recognition and analysis to help pregnant women monitor their fetal status daily at home and predict their delivery date by analysing their saliva crystallization. The method combines the information of the fractal dimension with some specific forms of crystals in the salivary crystallization and estimates the delivery date in both quantitative and qualitative manners. The accuracy of the prediction was satisfactory, with 100% delivery in the predicted week, 93.3% within the three days and 86.7% on the day as the prediction.

Biography

Yao-Xiong Huang, at the present is a professor of biomedical engineering and medical physics. in the Department of Biomedical Engineering, Jinan University. He also has been the Member of the Academic Degree Committee of the State Council of China; the Vice President of the Chinese Society of Medical Physics; the Member of the Science Committee of International Organization of Medical Physics; and the chairman of the Science Committee of Asia-Oceania Federation of Organization for Medical Physics. His specialty: Biophysics, biomedical engineering, physics, medical physics, photobiology and laser medicine. Since 1978, he has engaged in the researches on Laser medicine, nano-biotechnology, medical imaging, optoelectronics, microscope imaging and spectroscopy, cellular and tissue engineering and nano-nuclear medicine. He has published over 400 papers and five academic books and is the owner of 36 patents.

Development of electroactive materials/surfaces for biosensors and biomedical applications

Jean-Manuel Raimundo

Aix Marseille Université, CNRS, France

Electroactive materials/surfaces are employed at the interface of electronics and biology due to their advantageous intrinsic properties as soft organic electronics. They can find applications in the field of biomaterials such as drug delivery systems when loaded with therapeutics, electroceuticals and biosensors. Electroactive materials or surfaces encompass with conducting polymers, ionic polymers/gels, dielectric elastomers, piezo- or magneto-electric polymers/composites and electrets. In this context we have designed and developed innovative and smart electroactive interfaces that can be electrically activated on-demand and used as is as active coatings or for the fabrication of biosensors based on transistors.

As first example we will present a smart coating that can stamp out of Gram-positive and Gram-negative bacteria strains on SAM-modified titanium surfaces by the application of a low voltage (0.2V). Hence, *Staphylococcus aureus* and *Klebsiella pneumoniae* were killed up to 95% and 90% respectively with full eradication if time is prolongated. More importantly, no harmful activity has been observed towards eukaryotic cells which clearly demonstrates the biocompatible character of these novel surfaces for further implementation.

In a second example we will present the used of lipid-modifed SAMs as electroactive sensing layer. As a proof of concept, we will present different sensors that were developed for the detection of Fe^{3+}, Cu^{2+} and Cs+ ions using different materials, inorganic transistors with silicon channel and organic transistors with a poly(3-hethyl)thiophene as channel, in combination with different types of probes grafted on the electroactive material. Our sensors present good specificities with exceptional low limit of detection down to the sub-femtomolar range, high sensitivity and a linear response over several decades.

Biography

Jean-Manuel Raimundo is full professor at CINaM (UMR 7325) and at Materials' Department of Polytech'Marseille (Aix-Marseille Université). He obtained a B.S. in Biochemistry (Univ. of Rennes) and a PhD at the Univ. of Angers (J. Roncali). Thereafter, he was consecutively postdoctoral researcher at ETH- Zürich (F. Diederich), ATER at the Univ. of Angers and postdoctoral researcher (in coll. TotalFina Elf) before being appointed assistant professor at the Univ. of Nice. His main activity is devoted to (supra)-molecular engineering of novel π-conjugated chromophores for optoelectronics and biomedical, surface science engineering and (bio)sensors applications. He is the co-founder in 2024 of Silon therapeutics.

Understanding genotoxicity of airway epithelium exposed to environmental mold

J. Chen[1,2], K. Zhang[1,2], J. Chen[1,2], S. Wu[1,2] and **A. Thakur[1,2]**

[1]Pritzker School of Molecular Engineering, University of Chicago, USA
[2]Ben May Department for Cancer Research, University of Chicago, USA

Mold exposure, both indoors and outdoors, presents a substantial public health risk due to its potential to cause a variety of illnesses through allergens, pathogens and toxins. A notable body of evidence links mold exposure to DNA damage, including fragmentation and mutation, which can lead to severe secondary health effects like cell death, aging and genetic mutations. These consequences can inaccurately repair DNA, potentially connecting mold exposure to serious conditions such as cancer or pulmonary fibrosis, an association that has been previously underestimated.

Our research employs a novel 3D-organotypic lung model (iLung) derived from human pluripotent stem cells (hPSCs), alongside advanced fungal spore culture and mouse models that simulate real-life pulmonary exposure to mold, to investigate the genotoxic effects of mold spores. Using these innovative research systems, we have found extensive DNA damage in lung cells infected with spores of *aspergillus fumigatus (Asp)* and *coccidioides posadasii (Cocci),* in which specific DNA damage motifs and mutation signatures were detected. In particular, single-nucleotide variant (SNV), insertion and deletion (Indel) mutations were further identified in a cohort of genes essential to lung biology or carcinogenesis. Based on the preliminary studies, our research aims to explore the genotoxicity of common indoor molds on the human respiratory system, understand the cellular and molecular mechanisms behind this genotoxicity and determine whether mold-induced DNA damage promotes cancer progression. Using cutting-edge technologies and models, including next-generation sequencing and single-cell transcriptomics, we expect to provide insights into the pathogenic mechanisms of fungal exposure and inform more effective prevention and diagnosis strategies for mold-related health issues.

Biography

Prof. Chen graduated with PhD at Cornell University and did post-doctoral training with Dr. Harold Varmus at Weill Cornell Medicine. She is an assistant professor at University of Chicago since 2020 as a K99/R00 awardee and has many papers published in Nature, Nature Biotech, Nature Commun, Cell Stem Cell, JEM and JCI etc.

Regulation of mTOR by phosphatidic acid

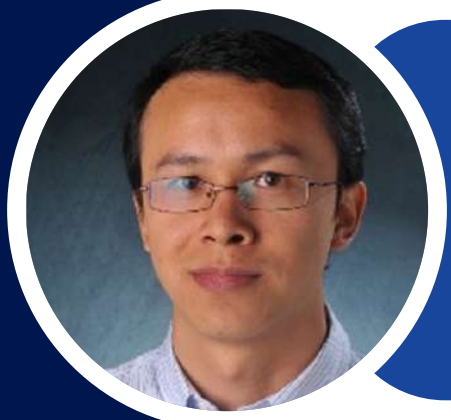
Maria A. Frias[1] and **David A. Foster**[2]

[1]Department of Biology, St. Francis College, USA
[2]Department of Biological Sciences, Hunter College CUNY, USA

mTORC1, the mammalian target of rapamycin complex 1, is a key regulator of cellular physiology. The lipid metabolite phosphatidic acid (PA) binds to and activates mTORC1 in response to nutrients and growth factors. After reviewing structural findings, we propose a model for PA activation of mTORC1. PA binds a highly conserved sequence on α4 helix of the FKBP12-rapamycin binding domain of mTOR. It is proposed that PA binding to two adjacent positively charged amino acids breaks and shortens the C-terminal region of α4-helix. This leads to profound consequences for substrate binding and catalytic activity of mTORC1.

Biography

Dr. Frias was a visiting graduate student in the laboratory of Dr. David Sabatini, at the Whitehead Institute for Biomedical Research. She received her PhD in Biomedical Sciences by the University of Lisbon in 2008. She then moved to New York City to pursue postdoctoral studies at the Rockefeller University and Hunter College – CUNY. Dr. Frias is an Assistant Professor of Biology at St. Francis College, where she keeps collaborating with her former postdoctoral mentor Prof. David Foster.



Printed liquid metal electronics for wearable applications

Jianliang Xiao

Department of Mechanical Engineering, University of Colorado Boulder, USA

Liquid metal (LM) exhibits a distinct combination of high electrical conductivity comparable to that of metals and exceptional deformability derived from its liquid state, thus it is considered a promising material for high-performance soft electronics. However, rapid patterning LM to achieve a sensory system with high sensitivity remains a challenge, mainly attributed to the poor rheological property and wettability. Here, we report a rheological modification strategy of LM and strain redistribution mechanics to simultaneously simplify the scalable manufacturing process and significantly enhance the sensitivity of LM sensors. By incorporating SiO_2 particles into LM, the modulus, yield stress and viscosity of the LM-SiO_2 composite are drastically enhanced, enabling 3D printability on soft materials for stretchable electronics. The sensors based on printed LM-SiO_2 composite show excellent mechanical flexibility, robustness, strain and pressure sensing performances. Such sensors are integrated onto different locations of the human body for wearable applications. Furthermore, by integrating onto a tactile glove, the synergistic effect of strain and pressure sensing can decode the clenching posture and hitting strength in boxing training. When assisted by a deep learning algorithm, this tactile glove can achieve recognition of the technical execution of boxing punches, such as jab, swing, uppercut and combination punches, with 90.5% accuracy. This integrated multifunctional sensory system can find wide applications in smart sport-training, intelligent soft robotics and human-machine interfaces.

Biography

Jianliang Xiao is an Associate Professor in the Department of Mechanical Engineering at University of Colorado Boulder. His research interests include stretchable/flexible electronics and mechanics of soft materials, thin films and nanomaterials. He was a recipient of the Best Paper Awards from ACM MobiCom '19 and Theoretical & Applied Mechanics Letters, the College Outstanding Dissertation Award (as advisor), Best Poster award (Colorado Photonics Industry Association Annual Meeting), ACS PRF Doctoral New Investigator award and ASME Haythornthwaite Research Initiation Award. He is a secretary of the Executive Committee and Newsletter Editor of ASME Applied Mechanics Division, Associate Editor of Frontiers in Sensors and Editorial Board member of NPJ Flexible Electronics, Science China Technological Sciences, Micromachines, Frontiers in Electronics, FlexTech and Frontiers in Bioengineering and Biotechnology.

Smartphone-enabled devices for dynamic analysis of biofluid samples at the point of care

Hatice Ceylan Koydemir[1,2]

[1]Department of Biomedical Engineering, Texas A&M University, USA
[2]Center for Remote Health Technologies and Systems, Texas A&M Engineering Experiment Station, USA

Advances in point of care diagnostic devices are essential to lower the fabrication cost and make them more accessible, especially for underserved populations. In this talk, I will present the most recent findings from my laboratory, focusing on the research on the development of optical technologies that use the advantages of 3D printing and low-cost microfluidic chip fabrication. The technologies that we developed do not require any specific brand smartphone and not require external optical components (such as lenses) to perform the measurement at the point of care and they provide nanoliter precision. It utilizes a 3D printed casing integrated with illumination sources and a low-cost sample cartridge. After data acquisition, it is processed using our custom-developed algorithms. Each platform costs less than 10$ and not require expertise to perform the measurements. We evaluated and validated the performances of our platforms using lab prepared samples, commercially available products and clinical samples. Providing an excellent agreement with the results obtained from equivalent gold standard methods, these cost-effective platforms can be a useful tool to analyze samples at the point of care.

Biography

Dr. Hatice Ceylan Koydemir is a tenure-track Assistant Professor at Texas A&M University in the Department of Biomedical Engineering, a member of the Texas A&M Engineering Experiment Station Center for Remote Health Technologies and Systems and a member of the NSF-funded ERC Precise Advanced Technologies and Health Systems for Underserved Populations (PATHS-UP). Dr. Koydemir is the Director of the Integrated Biomedical Sensing and Imaging Laboratory of Texas A&M University and her research interests are in the area of integrated devices and machine learning approaches, including mobile microscopes, MEMS-based biosensors, micro-fabrication technologies and wearables for point-of-care analysis. She has co-authored more than 150 peer-reviewed publications in major scientific journals and conferences and holds seven issued/filed patent applications. Dr. Koydemir is a member of the SPIE, Optica and BMES, as well as a senior member of IEEE.

The future of biosensors and bioelectronics: Time to consider broader ethical issues in the use of wearable biosensors in smartwatches

O. E. Amah

Lagos Business School, Pan-Atlantic University, Nigeria

Biosensors and bioelectronics have made remarkable progress in medicine, environmental monitoring, food/safety and various industries. The data collected by these tools include biochemical, electrophysical, biomechanical, temperature and gas concentration, biometric and environmental data. These data provide help in medical diagnosis, continuous monitoring of the health of individuals and environmental monitoring and help professionals make informed decisions. Recently, smartwatch manufacturers have used the output of biosensors and bioelectronics in developing products that add value to their smartwatches. The emphasis of the manufacturers is always the value-added, which elevates the economic value of the watches in the eyes of the user and gives the manufacturers a competitive advantage. However, the ethical implication of the use by their customers is not given appropriate attention except for some caveats that are included.

The measurements captured by the watches include monitoring heart rate and activities during physical exercise, tracking sleep, blood oxygen, electrocardiogram, stress monitoring and monitoring temperature. Customers take the measurements as given and may or may not make further consultations when they obtain suspicious results. The watch manufacturers try to give direction on using the measures, but more actions are required to protect the users. The future of biosensors and bioelectronics must factor in the ethical implications of using their output by a third party. They must be interested in how the third party uses these measures and take full responsibility to ensure that ethical issues around the use are adequately articulated and analyzed. The presentation will address how the users of smartwatches adopt the measures they obtain and what actions they take to protect themselves. It will also address the input they got from the watch manufacturers besides just writing a non-involvement clause. Ethics has moved from law-driven to using virtue ethics that is internally cultivated and used. The outcome will help redesign the future of biosensors and bioelectronics.

Biography

Dr. Okechukwu Amah facilitates Management Communication, Human Resources, Leadership and Human Behaviour sessions in Organisations at Lagos Business School. He is also the Research Director at Lagos Business School.

Dr. Amah obtained his first degree in petroleum engineering from the University of Ibadan, his MBA and his Ph.D. from the University of Benin. He started his career as a petroleum engineer with Texaco Overseas Nigeria Limited, where he held key positions as District Petroleum Engineer and Assistant District Manager in charge of drilling, production and support services. He assumed the role of Production Manager before the company merged with Chevron Nigeria Limited. After that joined Chevron Nigeria Limited and held other pivotal positions in the organization before moving on.

Dr. Amah researches work/family conflict and facilitation, employee engagement relationships, organizational citizenship and servant leadership behavior in Nigeria.

He is a member of the Society of Petroleum Engineers, Nigerian Academy of Management, American Academy of Management, Society of Human Resources Management and Southern Management Society.

Understanding the effect on the state of health of a lithium-ion battery caused by charging at a high current rate

A. Valverde[1], A. Perez[1], V. Quintero[2], M. Orchard[2] and **F. Jaramillo[3]**

[1]School of Electrical Engineering, University of Costa Rica, Costa Rica
[2]Faculty of Electrical Engineering, Universidad Tecnologica de Panama, Panamá
[3]Department of Electrical Engineering, University of Chile, Chile

Numerous studies have delayed into exploring the degradation of lithium-ion batteries (LIBs) under various discharge conditions. However, scant attention has been paid to the impact of the charging process on the remaining useful life of these batteries. Typically, the charging process adheres to the well-known Constant Current – Constant Voltage (CCCV) protocol. While many datasheets exposed the degradation phenomenon during the battery discharge at nominal current levels, they often underscore that the charging process is conducted at a current equal to half the full value of the battery's nominal rating. It's widely acknowledged that charging at higher currents can detrimentally affect battery lifespan. Yet, a pertinent question arises: Is there an optimal higher current rate value that can reduce charging time without significantly compromising battery lifespan. This study aims to address this question by investigating the charging behavior of two Samsung INR18650-20S LIBs cycled under nominal discharge conditions but charged at different C-rates: 1C and 2C. Over a span of 400 cycles, the evidence reveals that the battery charged at 1C experienced a nominal capacity loss of nearly 5%, whereas the one charged at 2C suffered an approximate 9% capacity loss. Despite the faster charging rate associated with higher C-rates, the adverse impact on battery lifespan becomes apparent, particularly when assessed through Electrochemical Impedance Spectroscopy (EIS) analysis, which indicates significant changes in internal impedance.

Biography

Andres Valverde Saborio, a 28-year-old electrical engineer born in Costa Rica, possesses a multifaceted background in semiconductor technology and lithium-ion batteries (LIBs). Growing up in San Jose, Valverde developed a fascination with electronics, which led him to pursue a bachelor's degree in electrical engineering

at the University of Costa Rica. He also added a post-bachelor's degree in electronic digital control, as an addition to his academic experience. Valverde professional journey began at Intel Corporation, where he gained experience in high technology semiconductor testing, optimizing performance and efficiency. In addition to his semiconductor experience, he expanded his skill set by collaborating at the CELEQ laboratory, where he conducted research on LIBs. There, he studied the degradation process of high C-rates, investigating factors influencing battery lifespan and performance. Combining his experiences in semiconductors and battery technology Andres is committed to advancing in both fields, driving progress towards more efficient and sustainable technologies.

Transcriptome analysis of wheat leaves in response to drought stress

Irada Huseynova[1,2], Samira Rustamova[1], Durna Aliyeva[1] and **Ulduza Gurbanova[1]**

[1]Institute of Molecular Biology & Biotechnologies, Ministry of Science and Education of the Republic of Azerbaijan, Azerbaijan
[2]Department of Molecular Biology and Biotechnologies, Baku State University, Azerbaijan

To identify stress-responsive genes and mechanisms, the transcriptomes of leaves in four Azerbaijani local bread wheat genotypes with contrasting drought tolerance (Zirva 85 and Murov 2 - drought tolerant, Aran and Gyzyl bughda - drought sensitive) have been studied under soil water stress. More than 120 million reads were generated from leaf tissues by the Illumina HiSeq 2500 platform.

According to the results of biochemical analysis, tolerant genotypes exhibited lower H_2O_2 and MDA values compared to susceptible genotypes and responded to drought by regulating the activity of antioxidant enzymes. Higher activity of antioxidant enzymes was observed in tolerant genotypes.

Less damage was detected by the electron microscopy analysis in leaves of the drought-tolerant genotypes. In the sensitive ones, violations in the integrity of membranes, fragmentation of mitochondria, and an increase in the number of plastoglobulins were observed.

NAD- malate dehydrogenase enzyme activity in leaves increased under drought for all genotypes, except Gyzyl bughda. aspartate aminotransferase activity also increased in all, but a statistically significant increase was observed in the tolerant ones. Stressed Zirva 85 leaves exhibited higher phosphoenolpyruvate carboxylase activity compared to other samples. The increase in phosphoenolpyruvate through the anaplerotic pathway of phosphoenolpyruvate carboxylase redirected the distribution of photoassimilates from

sugars/starch to organic acids and amino acids. These findings highlight the significant role of these metabolic enzymes in the carbon and energy partitioning during plant adaptation to drought stress.

Biography

Academician İrada Huseynova is Vice-President of ANAS and general director of Institute of Molecular Biology and Biotechnology. He has published over 50 papers in reputed journals and has been serving as an editorial board member. And she is also Vice-chairman of the Scientific Council on Biological Problems of the Research Coordination Council of the Republic of Azerbaijan; Professor of the Biophysics and Molecular Biology Department, Baku State University. Associate editor f of the Official Journal "Proceedings of Azerbaijan National Academy of Sciences" (Biological and Medical Sciences).

Evaluation of postmortem changes in tooth enamel and pulp by micro CT to determine the postmortem interval

Selcuk Cetin[1], Nihat Akbulut[2] and **Bulent Eren[3]**

[1]Forensic Medicine Department, Facuty of Medicine, Tokat Gaziosmanpasa University, Turkey
[2]Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Samsun Ondokuzmayis University, Turkey
[3]Forensic Medicine Department, Faculty of Medicine, Kırklareli University, Turkey

Determining the postmortem interval (PMI) is one of the main topics of forensic medicine. The main purpose of this prospective in vitro study that was the Micro-CT evaluation of dental pulp volume, dentin thickness and enamel-cement thickness, abrasion and mineral density in terms of PMI determination.

The study involved 60 female Wistar rats which were These rats were grouped into six different post-mortem period categories based on the PMI period as week-0, week-1, week-2, week-4, week-8 and week-12. Following the animals' sacrifice, they were subjected to a natural putrefaction period, with a control group, in the grounds of a sheltered garden. Hemi-mandible samples were then extracted and placed in glass tubes for Micro-CT evaluations. Mineral density of enamel and the surface abrasion of hard dental tissues, the pulp volume and dentin thickness were assessed using Micro-CT. Micro-CT was employed to analyze sixty right mandibular second molar teeth in the hemi-mandible.

The enamel and cement thickness remained the same in the examined PMI periods. Mineral density of the enamel tissues were also similar until the 8th week but the decrease was significant at 12th week (2.313 gHAp cm^3). Surface abrasion of the dental tissues on weeks 4, 8 and 12 were 0.006, 0.024 and 0.024 mm, respectively. The crown pulp volume exhibited a reduction at 12th week, with a value of 0.239 mm^3 after a three-month period of natural putrefaction ($p< 0.001$). However, there was no statistically significant changes in root pulp volume and dentin thickness variables.

Despite certain limitations associated with this study, the Micro-CT findings concerning dental pulp volume can serve as an objective parameter, especially for late period PMI estima-

tion. The present study also indicated that surface abrasion and enamel mineral density evaluation via micro-CT can be considered as objective and precise parameters in PMI evaluation.

Biography

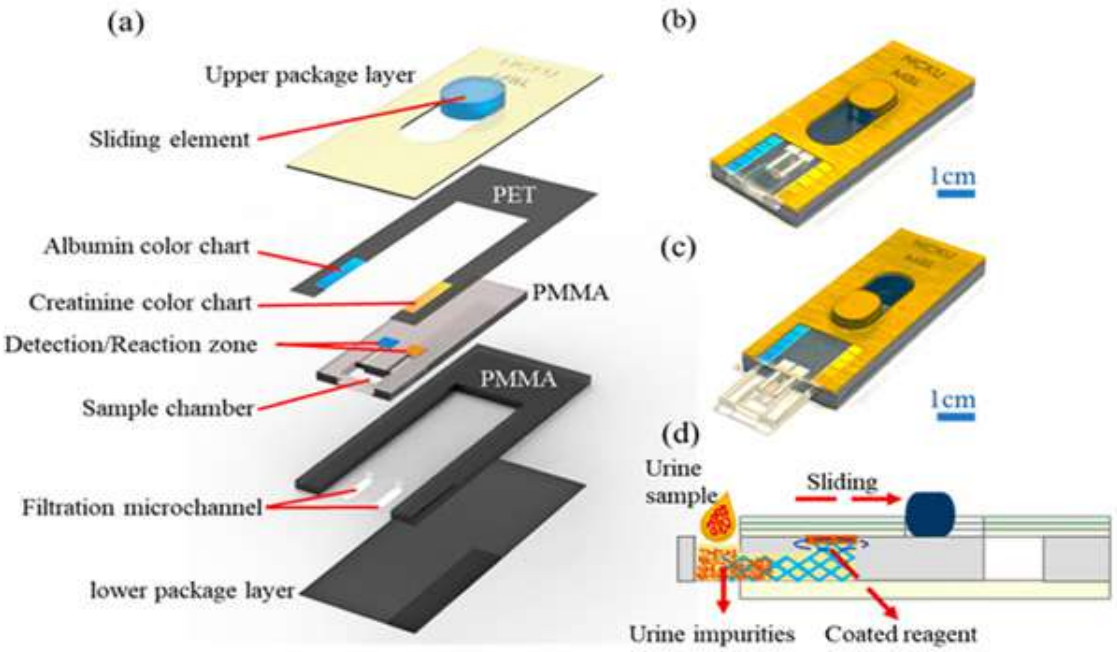
He graduated from Samsun Ondokuzmayıs University Faculty of Medicine in 2008. After working as a general practitioner in the emergency service for 1 year, he started his specialty training in the Department of Forensic Medicine at Uludağ University Faculty of Medicine in 2009. After graduating from this department as a Forensic Medicine Specialist in 2013, he worked at Kayseri Forensic Medicine Institution for 2 years. Finally, he has been working as the Head of the Department of Forensic Medicine at Tokat Gaziosmanpasa University Faculty of Medicine since 2015.

Microfluidic sliding paper-based device for point-of-care determination of albumin-to-creatine ratio in human urine

Szu-Jui Chen[1] and **Lung-Ming Fu**[1, 2]

[1]Department of Engineering Science, National Cheng Kung University, Taiwan
[2]Graduate Institute of Materials Engineering, National Pingtung University of Science and Technology, Taiwan

This paper presents a novel assay platform comprising a microfluidic sliding double-track paper-based chip and a handheld Raspberry Pi detection system for the quantification of the albumin-to-creatinine ratio (ACR) in human urine. The ACR is a clinically significant parameter with implications for the early detection of conditions such as renal insufficiency. In this proposed method, the microchip's sliding layer facilitates the movement of the urine sample through two parallel filtration channels, directing it to the reaction and detection areas of the chip, thus enabling the completion of the detection reaction. This straightforward approach is well-suited for self-diagnosis of the ACR index in human urine. The assay relies on the analysis of RGB (red, green and blue) value intensity signals generated by the reaction complexes in these two reaction zones, with data processed by a Raspberry Pi computer to derive ACR values, specifically albumin (ALB) and creatinine (CRE) concentrations. These results demonstrate a linear relationship between the G + B value intensity signal and the ALB and CRE concentrations, yielding correlation coefficients of R^2 = 0.9919 and R^2 = 0.9923, respectively. Furthermore, this proposed result conducted a validation study using 23 urine samples obtained from patients suffering from chronic kidney disease (CKD), confirming that the ALB and CRE concentration results obtained through our proposed method closely align with those acquired using a conventional high-reliability macroscale method. In summary, our findings establish the utility of our method as a convenient, real-time, reliable and cost-effective solution for point-of-care CKD diagnosis and monitoring in clinical applications.



Biography

Szu-Jui Chen is an enthusiastic and devoted Ph.D. student at National Cheng Kung University pursing advanced studies in engineering science. His research field is microfluidic, biosensor and lab on chip. His academic path is characterized by a deep-seated commitment to research, an unquenchable thirst for knowledge and an unwavering determination to make substantial contributions to his discipline. He has demonstrated a strong commitment to academic excellence throughout his Ph.D. degree. As a result of our exceptional academic accomplishments, he has been awarded several scholarships, research grants and patent. Their research has been published in prestigious journals and presented at prominent microfluidic biochip conferences. He is dedicated to contributing to the academic community and spreading knowledge to a wider audience.

A smart thermoresponsive macroporous 4D structure by 4D printing of Pickering emulsions stabilized by plasma-functionalized starch nanomaterials for a possible delivery system

Mahdiyar Shahbazi[1], H. Jäger1, R. Ettelaie[2], J. Chen[3], P. Asghartabar Kashi[4] and **M. Ulbrich[5]**

[1]Institute of Food Technology, University of Natural Resources and Life Sciences (BOKU), Austria
[2]Food Colloids and Bioprocessing Group, School of Food Science and Nutrition, University of Leeds, UK
[3]Food Oral Processing Laboratory, School of Food Science & Biotechnology, Zhejiang Gongshang University, China
[4]Faculty of Biosystem, College of Agricultural and Natural Resources, Tehran University, Iran
[5]Department of Food Technology and Food Chem., Chair of Food Process Engineering, Technische Universität Berlin, Germany

Hierarchically porous structures combine microporosity, mesoporosity and microporosity to enhance pore accessibility and transport, which are crucial to develop high performance materials for biofabrication, food and pharmaceutical applications. This work aimed to develop a 4D-printed smart hierarchical macroporous structure through 3D printing of Pickering-type high internal phase emulsions (Pickering-HIPEs). The key was the utilization of surface-active (hydroxybutylated) starch nanomaterials, including starch nanocrystals (SNCs) (from waxy maize starch through acid hydrolysis) or starch nanoparticles (SNPs) (obtained through an ultrasound treatment). An innovative procedure to fabricate the functionalized starch nanomaterials was accomplished by grafting 1,2-butene oxide using a cold plasma technique to enhance their surface hydrophobicity, improving their aggregation and thus attaining a colloidally stabilized Pickering-HIPEs with a low concentration of each surface-active starch nanomaterial. A flocculation of droplets in Pickering-HIPEs was developed after the addition of modified SNCs or SNPs, leading to the formation of a gel-like structure. The 3D printing of these Pickering-HIPEs developed a highly interconnected large pore structure, possessing a self-assembly property with thermoresponsive behavior. As a

potential drug delivery system, this thermoresponsive macroporous 3D structure offered a lower critical solution temperature (LCST)-type phase transition at body temperature, which can be used in the field of smart releasing of bioactive compounds.

Biography

Mahdiyar Shahbazi is a Lecturer at the University of Natural Resources and Life Sciences (BOKU University) in Vienna, Austria with over 10 years of experience in the application of innovative sustainable biomaterials (biopolymer, composite and nanoparticles) in the 3D printing process. He has worked in the bio-fabrication of materials by different types of 3D printing technology to valorize the 3D printed objectives with enhanced multi-functionality. He also has a solid background to lead the research on colloids and interface, soft matter, as well as the behavior of biomaterials upon different 3D printing systems. In the latter case, he has systematically focused on the kinetic evaluation of the biomaterials' molecular behavior under extrusion-based or laser powder bed fusion 3D printing systems to highlight the important role of the printing conditions on biopolymer processability. The accomplishments of creating this noteworthy list of research areas are associated with the actual coordination and academics in addition to the industry involvement of Dr. Shahbazi, linking faculty and industry partners from numerous disciplines and securing considerable research funds.

A novel biosensor based on corn tassel polyphenol oxidase for detection of dopamine

Reyhan Gül Güven[1], Kemal Güven[2] and **Remziye Güzel[1]**

[1]Ziya Gökalp Education Faculty, Mathematics and Science Education Section, Dicle University, Turkey
[2]Science Faculty, Molecular Biology and Genetics Department, Dicle University, Turkey

Dopamine (DA) is a widely occurring biologically active molecule within the human body and plays a pivotal role in neurotransmission, often associated with numerous neurological disorders. Therefore, the precise and selective detection of dopamine is crucial for the early diagnosis of diseases stemming from abnormal dopamine levels. In this investigation, a biosensor was developed utilizing a crude extract of polyphenol oxidase (PPO) derived from corn tassel, along with glutaraldehyde on a glassy carbon electrode (GCE). Differential pulse voltammetry (DPV) and cyclic voltammetry were employed for dopamine detection. Optimal pH and temperature for the biosensor were determined to be 4.0 and 30°C, respectively. The electrode response depends linearly on dopamine concentration between the linear range is from $5.0x10^{-7}$ to $1.0x10^{-4}$ M. The highest response was obtained when 0.05 V was applied as the working potential. Due to being reliable, simple, rapid to prepare and low cost, it makes this biosensor an attractive alternative to the procedures presently used for pharmaceutical formulations.

Biography

Prof. Dr. Reyhan Gül Güven completed her undergraduate education in the Department of Biology, Faculty of Science at Dicle University in 2001 with honors. She completed her master's degree in 2004 and her doctorate in 2007 at the Institute of Natural and Applied Sciences at Dicle University. In 2006, she conducted research on bacterial identification and enzyme purification at the National Research Council Institute of Biomolecular Chemistry (CNR) in Naples, Italy. In 2012, she engaged in postdoctoral studies at the University of Nottingham in the United Kingdom. She has published articles in national and international journals on topics such as enzyme purification, bacterial identification and biosensors, as well as contributed book chapters and presented numerous papers at national and international platforms.

Bacterial nitroreductases as prodrug-activating enzyme for cancer gene therapy and for biosensoring the pollutants

Kemal GUVEN, F. Rozan TUSAR and **Fatma MATPAN BEKLER**

Department of Molecular Biology and Genetics, Science Faculty, Dicle University, Turkey

Bacterial nitroreductases grouped in the flavin-containing enzyme family have the potential to be used in many different biotechnological fields due to their ability to metabolize nitrogenous compounds that are toxic, mutagenic or carcinogenic. Most important uses of nitroreductases are in biosensoring pollutants and in GDEPT (gene-directed enzyme prodrug therapy) for treatment of cancer. To study and clone bacterial nitroreductases of biotechnological importance, we have isolated moderate thermophilic *Bacillus* species (*Bacillus subtilis* 4NK, *Bacillus licheniformis* FMB3, *Bacillus zhangzhounesis* 2ÇM4, *Bacillus zhangzhounesis* 2ÇA, *Bacillus licheniformis* 2ÇS, *Bacillus cereus* KG5) from different hot springs in Turkey and identified by 16S rRNA gene sequence analysis. All strains were cultivated at optimum temperatures and collected by centrifugation, after which their genomic DNAs from pellets were extracted and purified using Genomic DNA purification kit (Omega-Bio-Tek: E.Z.N.A) and analysed by fluorometric methods by Qubit3 fluorometer. Library preparation of isolated DNA material was performed using the Illumina DNA Prep (Illumina, USA) kit. After the library preparation process, random fragmentation, amplification and purification processes were carried out. The length distribution of the prepared library was measured using 2100 Bioanalyzer (Agilent, USA). For sequencing, Illumina NovaSeq 6000 new generation sequencing platform was used. FASTQC tool was also used for quality control of the read data obtained after sequencing. The nucleotide sequence of the nitroreductase genes was screened using the NCBI tool (https://www.ncbi.nlm.nih.gov/) and the primers were designed. All bacterial strains were found to possess putative NADH/NADPH nitroreductase genes in their genomes. Nitroreductase genes from thermophilic *Bacillus* species were amplified by PCR and the products were purified and concentrated for DNA sequencing. Moreover, nitroreductase activity was also determined spectrophotometrically in most strains following partial purification using the substrate nitrofurazone and electron donating cofactors such as NADH/NADPH. This study is novel for moderate thermophilic bacterial nitroreductases for use in biotechnological applications.

Biography

Kemal GÜVEN is currently a professor of Molecular Biology and Genetics Department in Dicle University, Turkey. He completed his PhD in Nottingham University (England) in 1994 titled “Invertebrate stress responses as molecular biomarkers in ecotoxicology”. He gained research scholarships from some associations such as Royal Society of Britain and CNR-Napoli-Italy. He had studied on a variety of subjects, including stress proteins, transgenic animals, biomarkers, the effects of heavy metals and pesticides, environmental biotechnology, the isolation and identification of thermophilic and petroleum degrading bacteria, the cloning and purification of biotechnologically important thermotolerant enzymes including beta-galactosidases and nitroreductases and the various effects of nanoparticles on bacteria.

Effects of edible alginate coating enriched with organic acids on quality of mango fruit during storage

R. Etemadipoor[1], S. Ehteshami[1], A. Mirzaalian Dastjerdi[1], A. Ramezanian[2], F. Abdollahi[1], M. Salari[1] and **M. Shamili[1]**

[1]Department of Horticultural Sciences, Faculty of Agriculture and Natural Resources, University of Hormozgan, Iran
[2]Department of Horticulture Science, School of Agriculture, Shiraz University, Iran

Application of edible coatings containing organic acids is an effective method to preserve the quality and improve the storability of fresh product. For this purpose, 2% sodium alginate (Al) alone as well as in combination with 1% citric acid (CA), malic acid (MA) and ascorbic acid (AsA) was used on 'Langra' mango. The samples were stored at 10 ± 1 °C and 90 ± 1% relative humidity for 32 days. The results indicated that all the Al-treated fruit maintained the quality of mango fruit. Al/AsA treatment was showed the lowest chilling injury whit ~ 54% difference compared to the control. Moreover, the minimum weight loss (4.18%) was observed in the Al/AsA treated fruit and the lowest firmness (3.61 N) was obtained in the control fruit while there were no significant difference between other treatments. Al/AsA treatment was showed the maximum content of AsA (18.29 mg100g^{-1} FW), total phenol (175.36 mgGAE100g^{-1} FW), flavonoid (40.94 mg quercetin 100 g^{-1} FW) and antioxidant activity (34.43%) at the end of storage while the highest level of the soluble solids content and the lowest level of titratable acidity were obtained in the control. Overall, these findings showed that the Al edible coating treatment by incorporation of' organic acids, especially with AsA, can be useful for preserving the quality of stored mango fruit.

Biography

- Name: Dr. Rasoul Etemadipoor
- Designation: Vice President of Technology and Support of Hormozgan Science and
- City/State/Province: Bandar Abbas/Hormozgan Province
- Country: Iran
- Nationality: Iranian

Qualification Awarded Degree/ Diploma/Certificate	Major Subject	University/ Institution	Year (From-To)
PhD	Horticultural Engineering	Hormozgan	2014-2019
M.Sc	Horticultural Engineering	Gillan	2005-2008
BSc	Agriculture Engineering	Rasht	2000-2004

Nylon nanofibres as an antibody immobilisation surface in a biosensor device: Study of their reusability and stability

Inés Peraile, Paloma Lorenzo-Lozano, Laura González-López, Nushin A. Dabbagh-Escalante, Juan C. Cabria-Ramos and **Matilde Gil-García**

Biological Defence Area, Department of NBC Defence Systems and Energetic Materials, National Institute for Aerospace Technology "Esteban Terradas" (INTA)-Campus La Marañosa, Spain

The use of biological agents is a widespread security concern. Therefore, the development of early detection and identification systems for biological agents, lab-on-a-chip (LOC) devices, which are specific, sensitive, miniaturisable, easy to use and low cost, has become a priority objective. Immunodetection provides the required speed and specificity. In the design of these immunological devices, the antibody immobilisation surface is crucial. Nylon nanofibres have been described as a very good choice because they allow an increase in the surface-to-volume ratio, leading to an increase in immunocapture efficiency. In addition to the need for a fast and specific detection system, stability and reusability of the immunocapture system are important features to make the system more efficient and cost effective. Our research team has conducted recently published studies to evaluate the cost-effectiveness of nylon nanofibres (DOI: 10.3762/bjnano.8.130). On the one hand, the reuse of nanofibres was investigated using different stripping treatments on nylon nanofibres, based on different pH values. Our study shows that stripping with glycine buffer, pH 2.5, allows the nanofibres to be reused as long as the protein A/G is previously anchored, leaving both the nanofibre and the protein A/G unchanged and reusable. On the other hand, we investigated the stability of nylon nanofibres over several months and found that these nylon nanofibres retained their immunocapture ability unchanged for longer than a Specialized planar surface. In conclusion, nylon nanofibres appear to be a very good choice as an antibody immobilisation surface, as they not only offer higher immunocapture efficiency, but are also more cost effective as they are reusable and stable.

Biography

Inés Peraile Muñoz has a degree in Biology and a PhD in Pharmacology and Human Therapeutics from the Faculty of Medicine of the Complutense University of Madrid. During this period she participated in 5 publications in high impact journals and in numerous national and international projects. Subsequently, Dra. Inés Peraile began her research career at *National Institute of Aerospace Technology* (INTA), in the Biological Defense Area, in 2010, taking up her position as a Senior Scientist at OPIS, with destination INTA, in November 2021. In September 2022 she was appointed Head of the Immunology Laboratory of the Biological Defense Area. During her stay at INTA she has participated in several national and European projects related to the diagnosis of pathogenic biological agents in the field of biosafety, both microorganisms and toxins, in environmental matrices. The results obtained in the framework of these projects have given rise to several publications, communications to national and international congresses.

Sensors used for tracking racing greyhound stride length and frequency

David Eager

Faculty of Engineering and Information Technology, University of Technology Sydney, Australia

Greyhounds run at speeds of over 70 km/h. Rapid changes in direction during running increase the risk of injury as greater forces act on limbs and torso. Sudden transitions in agile maneuvers of results in them being more prone to sustain injuries to the very high peak forces developed upon ground contact (over a brief stance duration). The conventional methods of gait analysis such as using force plates are not always a feasible option in locomotion studies. To overcome these difficulties a tri-axial accelerometer is utilized to analyzing rapid running locomotion dynamics of a greyhound. Kinematics data from videography of the entire race was recorded for calibration and data analysis. Also paw print analysis was recorded for data calibration. The mean stride frequency in the straight (M= 3.4 Hz, SD= 0.2) and bend (M= 3.8 Hz, SD= 0.5) was calculated and did not show a significant difference in an ANOVA [F (1, 20) = 1.6, P= 0.2] and t-test [t (10) = 1.2, P= 0.1]. The mean stride lengths in the straight (M=5.53 m, SD=0.03) and bend (M=5.02 m, SD=0.08) was calculated. The result of ANOVA test showed a significant difference between the stride lengths in straight and bend section [F (1, 18) =20.7, P=0.0002]. The result of a post ANOVA analysis (t-test: Paired Two Samples for Means) suggests that stride lengths at straight section are significantly greater than those of a turn section [t (9) =4.1, P=0.001].

Biography

David Eager is the Professor Risk Management and Injury Prevention at the University of Technology Sydney (UTS), Australia. He leads and co-ordinates several greyhound safety and welfare projects. The UTS greyhound safety and welfare team has reviewed and provided recommendations on multiple tracks within the Australasian Greyhound Industry. David is a Fellow of Engineers Australia and a Chartered Professional Engineer. He was the UTS Assistant Student Ombud for twelve years and is a past Deputy Chair of the UTS Academic Board. He has also held the position of Head of School, Mechanical and Mechatronic Engineering UTS.

Highly selective THC detection based on molecularly imprinted polymers

Mina Hoorfar

School of Engineering and Computer Science, University of Victoria, Canada

Trans-Δ^9-tetrahydrocannabinol (THC), the primary psychoactive substance in cannabis, has drawn significant attention because of its legalization and widespread use for medicinal and recreational purposes. THC causes the intoxication of cannabis, including reduced cognitive and motor functions. Developing a simple, robust and reliable technique for detecting THC is essential in various applications, including for clinical, forensic, quality assessment, air quality monitoring and law enforcement purposes; however, it is highly challenging to detect THC at trace levels concentrations in complex samples containing other analytes as well as water molecules. High-performance liquid chromatography (HPLC) and gas chromatography (GC) combined with a mass spectrometer (MS) and a flame ionization detector (FID) are well-established gold-standard techniques for the determination of THC presence and concentration. However, sample pre-treatment is required to perform these analyses and they suffer from costly and lengthy processing times and are also limited by their complexity and lack of portability. There is a need for rapid analysis, high sensitivity, selectivity and portable and efficient methods that can be used for continuous monitoring of THC.

This study demonstrates the potential of microfluidic systems, Raman spectroscopy and electrochemical sensors based on molecularly printed polymers (MIPs) for real-time, on-site THC detection with high sensitivity and selectivity. The proposed approaches hold promise for advancements in forensic analysis, medical diagnostics and regulating cannabis-related products.

Biography

Dr. Mina Hoorfar is a Professor and Dean of Engineering and Computer Science Departments, The University of Victoria, Canada. She was a Professor and Director of the School of Engineering, The University of British Columbia, Canada. She is known nationally and internationally for her research and innovation in microfluidics and its applications to device miniaturization and sensing technologies. Her group has extensive experience in surface science and the development of lab-on-chip devices for cancer cell detection, online monitoring of water quality and portable sensors for sensitive and selective detection of target gases. Her work has led to several patents, licenses and commercialization with industrial partners in different sectors including oil/gas, wastewater, health and safety and security.

Non-invasive diagnosis method for cutaneous leishmaniasis with high specificity and sensitivity

Yasaman Taslimi[1], Sima Habibzadeh[1], Roya Yousefi[1], Vahid Mashayekhi[2], Amin Akbarzadeh[2], Zahra Azarpour[2], Safoora Gharibzadeh[3], Josephin Persson[4], Ali M Harandi[4,5], Amir Mizbani[6] and **Sima Rafati[1]**

[1]Department of Immunotherapy and Leishmania Vaccine Research, Pasteur Institute of Iran, Iran
[2]Cutaneous Leishmaniasis Research Center, Mashhad University of Medical Sciences, Iran
[3]Department of Epidemiology and Biostatistics, Research Centre for Emerging and Reemerging Infectious Diseases, Pasteur Institute of Iran, Iran
[4]Department of Microbiology and Immunology, Institute of Biomedicine, Sahlgrenska Academy, University of Gothenburg, Sweden
[5]Vaccine Evaluation Center, BC Children's Hospital Research Institute, The University of British Columbia, Canada
[6]ETH Zurich, Switzerland

Fast and accurate diagnosis of cutaneous leishmaniasis (CL) is important for epidemiological and health management strategies. Gold standard diagnostic methods for CL include culturing and direct identification of parasite by microscopy. These methods are invasive, painful and may cause co-infection. Low specificity and sensitivity, being time consuming and requiring lab expertise are their other limitations. There is therefore a need for rapid diagnostic approaches usable in the field. Loop-mediated isothermal Amplification (LAMP) is a sensitive, rapid and cost effective diagnostic technique that has been used for point of care diagnosis of different infectious diseases. Our goal in this study was to combine the tape-disc noninvasive sampling method with LAMP assay for diagnosis of CL caused by *L. tropica*. Thirty-five *L. tropica* infected patients along with 35 non-*L. tropica* patients and 35 healthy individuals were subjected to tape-disc LAMP diagnosis. The genomic DNA was isolated from tape-disc and used in LAMP reaction. Standard reference strains of *L. tropica*, along with samples from 35 patients with other cutaneous disease with clinical manifestations similar to CL and 35 healthy individuals were used for determining sensitivity and specificity of the method, which were both 100% for *L. tropica*.

In this study, we developed a method based on non-invasive sampling and LAMP isothermal assay for detecting *L. tropica*. The major advantage of this non-invasive method is visual detection of leishmaniasis in less than 30 minutes with naked eyes without need of expensive PCR instrument. And our future work would be using this method as a biosensor.

Biography

Yasaman Taslimi has been working in Immunotherapy and *Leishmania* Vaccine Research Department in Pasteur Institute of Iran and participated and experience in different projects such as diagnostic methods, designing DNA and live vaccines against leishmaniasis also drug efficacy.

A novel microfluidic paper-based analysis system for determining Blood Urea Nitrogen

Chien-Hsuan Ko[1,2,3] and **Lung-Ming Fu**[3]

[1]Department of Electrical and Computer Engineering, Texas A&M University, USA
[2]Center for Remote Health Technologies and Systems, Texas A&M University, USA
[3]Department of Engineering Science, National Cheng Kung University, Taiwan

This study proposes an innovative microfluidic multiple detection (MMD) platform for determining blood urea nitrogen (BUN) concentrations in whole blood samples. The platform consists of a microfluidic chip and a self-built detection system. A drop of whole blood is injected into the inlet of the microfluidic chip and filtered through strips of hemofiltration paper. The plasma enters the BUN detection chamber and is absorbed by pre-placed test strips embedded with analyte-specific reagents. Secondary reagents are introduced into the detection chamber using a finger pump, and the chip is heated to induce the Berthelot reaction. A CMOS camera captures an image of the reaction compounds and transmits it to a smartphone, where the BUN concentration is derived from predetermined calibration curves using RGB analysis software, covering a detection range of 0.1 to 150 mg/dL. The platform's effectiveness was demonstrated by comparing results from 38 whole blood samples from chronic kidney disease (CKD) patients with measurements from a traditional benchtop system. The results confirm that the proposed MMD platform offers a cost-effective, convenient, and rapid technique for BUN determination in point-of-care (POC) contexts. The BUN values obtained using the MMD platform were in excellent agreement with those acquired through the conventional system, highlighting its potential for POC BUN monitoring.

Biography

Chien-Hsuan Ko received the M.D. degrees in Materials Engineering from National Pingtung University of Science and Technology (NPUST), Pingtung, Taiwan in 2017. He is currently Ph.D. training with the Department of Engineering Science at National Cheng Kung University (NCKU), Taiwan. His graduate work focuses on microfluidic paper-based devices and applications of microfluidic system.

PEERS ALLEY MEDIA

DISTINGUISHED SPEAKER TALKS

DAY 2

Joint Event

Future of Biosensors and Bioelectronics

&

Advances in Structural Biology and Protein Chemistry

June 20-21, 2024
Barcelona, Spain

FUTURE OF BSBE 2024 &
ADV. STRUCTURAL BIO 2024

From intelligent sensors to digital twin for healthcare

Xueji Zhang [1,2]

[1]Shenzhen University, China
[2]AI Guangdong Lab, China

The convergence of biosensors and artificial intelligent technology represents a pivotal advancement in the healthcare domain. This presentation embarks on a journey exploring the transformative potential of harnessing intelligent biosensors to create digital twins for healthcare applications. It delves into the evolution of biosensor technology and its critical role in the realization of digital healthcare ecosystems.

The presentation will commence with an overview of intelligent biosensors, showcasing their development, capabilities and the diverse range of applications within the healthcare sector. Emphasis will be placed on the continuous improvements in biosensor accuracy, miniaturization and connectivity, which are fundamental in gathering real-time physiological data. Subsequently, we will delve into the concept of digital twins and their relevance in healthcare. Digital twins are virtual representations of real-world entities and in the context of healthcare, they serve as dynamic models of patients, enabling personalized and proactive healthcare interventions. We will discuss the integration of biosensor data into digital twin models, facilitating the creation of highly accurate and responsive patient profiles. Furthermore, this presentation will highlight emerging trends and future directions, including the potential for real-time remote patient monitoring, predictive diagnostics and the advancement of precision medicine through digital twins.

In conclusion, the presentation aims to provide a comprehensive understanding of the journey from intelligent biosensors to digital twins for healthcare. Attendees will gain insights into the technological advancements, ethical considerations and transformative potential that this fusion of technologies brings to the healthcare landscape.

Biography

Dr. Xueji Zhang is vice president of Shenzhen University, Professor in the School of Biomedical Engineering at Shenzhen University, P.R. China. He is also professor at Univ. of Sci. & Technol Beijing and executive president of National Institute of Precision Medicine & Health, Beijing. He was a research scientist, Sr. scientist, chief scientist, Vice President and Sr. Vice President at World Precision Instruments, Inc. USA until 2010, when he joined USTB as National Chair Professor. His lab focuses on the development of novel biosensors, tools and devices to study free radicals, cancer biomarkers, profiling changes in animal or human associated with diseases and exploiting this information for development of diagnostic and therapeutic approaches. He serves as the chief editor of Sensors & Diagnostics and has been editorial member of 23 international journals. He has received numerous national and international awards and honors including Member of Russian Academy of Engineering, Fellow of American Institute for Medical & Bioengineering, Fellow of Royal Chemical Society, National Innovation Award, China, Scientist of Year in China and Simon Fellow of ICSC-World Lab. He has authored over 500 papers, 8 books and over 100 patents and developed numerous sensors and instruments for commercialization.

Characterization of Alginate–Gelatin–Cholesteryl Ester Liquid Crystals bioinks for extrusion bioprinting of tissue engineering scaffolds

Alyaa Idrees Abdulmaged[1], Chin Fhong Soon[2], Balkis A. Talip[1], Siti Adibah Ahmad Zamhuri[2], Salama A. Mostafa[3] and **Wenbin Zhou[4]**

[1]Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, Malaysia
[2]Microelectronics and Nanotechnology-Shamsuddin Research Centre, Institute for Integrated Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia
[3]Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia, Malaysia
[4]Department of Mechanical Engineering, Imperial College London, UK

Bioink development is an innovative approach to fabricate bio-substitutes for tissue engineering applications. The research on bioink attempts to offer a 3D complex architecture and control cellular behavior that improve cell physical properties and viability. This research proposed a new multimaterial bioink based on alginate (A), gelatin (G) and cholesteryl ester liquid crystals (CELC) biomaterials, namely (AGLC) bioinks. The development of AGLC was initiated with the optimization of different concentrations of A and G gels to obtain a printable formulation of AG gels. Subsequently, the influences of different concentrations of CELC with AG gels were investigated using a microextrusion-based 3D bioprinting system. The AGLC bioinks were formulated using AG gel with 10% w/v of A and 50% w/v G (AG10:50) and 1%, 5%, 10%, 20% and 40% of CELC, respectively. The printed filament has a minimum width of 1.3 mm at a 1 mL/min extrusion rate with 10% w/v A, 50% w/v G and 40% v/v CELC (AGLC40). Post-printing polymerization of the AGLC bioinks with calcium (Ca^{2+}) ions shows well-defined and more stable structures. The physicochemical and viability properties were examined by FTIR, DSC, contact angle, FESEM, MTT assay and cell interaction evaluation methods. The FTIR spectra of the AGLC bioinks exhibit a combination characteristics vibration of AG10:50 and CELC. The DSC analysis indicates the high thermal stability. Wettability analysis shows a reduction in the water absorption ability of the AGLC bioinks. FESEM analysis indicates that the surface morphologies of the bioinks exhibit varying microstructures. *In vitro* cytotoxicity by MTT assay shows the ability of the bioinks to support the biological activity of HeLa cells. The AGLC bioinks show average cell

viability of 82.36% compared to the control (90%). Furthermore, cultured cells on the surface of AGLC bioinks showed that bioinks provide favorable interfaces for cell attachment.

Biography

Alyaa Idrees Abdulmaged was born in Iraq on March 1986. She received a B.Sc. degree in biology science from Mosel University, Iraq, in 2008. After completing the B.Sc. degree, she worked in a private medical laboratory from 2008-2010, then taught in a private school from 2011-2012. She pursued an M.Sc. degree at the Faculty of Applied Science and Technology, Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia. Her research interests are in the areas of cell biology, biotechnology and biomaterials.

Magnetoelectric nanorobots for magnetically assisted cell targeting, electroporation and on-demand drug delivery

Soutik Betal[1], Nandan Murali[1], Amar Bhalla[2] and **Ruyan Guo[2]**

[1]Indian Institute of Technology Delhi, India
[2]University of Texas at San Antonio, USA

World's Smallest medical robot as the record set on Guinness World Records works on magnetoelectric mechanism in a core-shell heterostructure nanocomposite. Under influence of remotely applied modulated magnetic field, the core and shell of the nanorobot interact with each other to generate high localized electric field. The magnetic body guides and excites Nanorobot's propel. The on demand shell's electrification gives Nanorobot, a capability to act as an ambient electrical field sensor in bio-cellular environment and performs four remotely controlled cellular interactions. Sensing minute electrical energy differences between different cell types, targeted single cell electroporation, usage of electrostatic force to excel Nanorobot's propelling speed and transport targeted cells to desired location with microscale precision in microvascular environment. The nanorobots can perform targeted drug delivery (localized treatments without harmful exposure) by enhanced drug loading on the surface and on-demand, swift drug release at targeted cancerous site. These phenomenal functionalities of magnetoelectric nanorobot address the solution to current technological limits in the targeted treatment methods of diseases such as Cancer and Alzheimer's with negligible side-effects.

Biography

Dr. Soutik Betal is Assistant Professor at Department of Electrical Engineering at Indian Institute of Technology Delhi. He obtained his PhD in Electrical Engineering from University of Texas at San Antonio, Texas, USA. Before joining as assistant professor at Indian Institute of Technology Delhi, he was postdoctoral fellow at Institute of Physics of Czech Academy of Sciences in Czech Republic, University of Maryland- Baltimore County in USA and Alfred University in USA. His research interest is in the field of nanorobotics, medical devices, nanofabrication, Brain computer interface, Terahertz modulators and magnetic sensors.

Health risk assessment of exposure to Benzene, Toluene, Ethylbenzene and Xylenes in a vehicle manufacturing industry in Iran

Sina Sadeghi Amin and **Touraj Nasrabadi**

Graduate Faculty of Environment, University of Tehran, Iran

Introduction: Considering the adverse carcinogenic and non-carcinogenic health effects of Volatile Organic Compounds (VOC) and specially Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) which are widely used in vehicle manufacturing industry, it is clear that monitoring and control of occupational exposure to these substances is of utmost significance. More often than not the studies on occupational exposure to VOCs in vehicle manufacturing industry - specifically BTEX – have been carried out exclusively in paint shop units. The purpose of this study was to assess occupational BTEX exposure & health risk in different units of a vehicle manufacturing industry.

Material and Methods: Foam injection unit (FIU), gluing unit (GU), repair shop unit (RSU), molding unit (MU) as well as paint shop units (PSU) were selected for this study. Sampling and analysis were conducted based on National Institute for Occupational Safety and Health (NIOSH) 1501 guidelines by utilizing MSA personal sampling pumps set to 0.2 l/m and Gas Chromatography equipped with Flame Ionization Detector (GC-FID). Risk characterization and assessment was performed using Environmental Protection Agency Risk Assessment Information System (EPA RAIS).

Results and Conclusion: The results revealed that the concentration of benzene in gluing and paint shop units was above occupational exposure limits. Carcinogenic risk levels in 8 out of 10 units registered in the 1E-2 to 1E-4 range and only two units registered a risk level below EPA's acceptable risk level (10-6). The highest risk levels were measured in gluing, paint shop and repair shop units. Furthermore, the total non-carcinogenic hazard quotient was measured higher than 1 in 8 out of 10 studied units. Considering the abundance and wide use of VOCs -most notably BTEX- and the adverse carcinogenic and non-carcinogenic health effects of these compounds, it is advised to: change the type of paint used in paint shops, improve the existing ventilation systems, develop new and more efficient ventilation systems and conduct consistent training.

Biography

Sina Sadeghi Amin is an aspiring Health and Safety Specialist with extensive experience in the field, currently working as a Health and Safety Consultant at Paydar Andishan Dana Pad, where he has been since February 2022. Prior to this role, Sina served as a Health and Safety Specialist at Digikala, from January 2021 to July 2022, where he gained valuable experience in the E-Commerce industry.

Sina holds a Master's degree in HSE from the University of Tehran and a Bachelor's degree in Occupational Health and Industrial Hygiene from Shahid Beheshti University of Medical Sciences and Health Services.

In addition to his academic qualifications, Sina has several professional certifications, including an Internal Auditor from QCB ITALIA(IRAN) and ISO 45001, 50001 & 22000 from URS.

He is currently interested in airborne pollution in construction sector, safety climate and psychological bias in the workplace.

Diving into the depths: Exploring underwater electronic sensor technology

Pooja Prasenan and **Supriya M.H**

Department of Electronics, Cochin University of Science and Technology, India

Sensors are used to perceive events or parameters in the environment where it is kept. Underwater electronic sensors play a crucial role in collecting various types of data for scientific research, environmental monitoring, industrial applications and defence purposes. These sensors are designed to operate in challenging underwater environments, where factors such as pressure, temperature and corrosion resistance must be carefully considered. The common types of underwater electronic sensors include pressure sensors, temperature sensors, salinity sensors, sonar system, Acoustic Doppler Current Profilers (ADCP), pH sensors, optical sensors, magnetic sensors, underwater cameras, gas sensors, hydrophones, CTD sensors etc. As marine water pollution is increasingly affecting the water bodies especially oceans it becomes important to monitor the causes influencing pollution. Most water bodies are significantly polluted, thus decreasing the potability of water. Due to increase in population, industrialization and urbanization, large quantities of sewage and industrial waste water are discharged into water bodies which has considerably contributed to the marine pollution. Water quality assessment has to be conducted, from time to time, to implement pollution control measures to rejuvenate the marine water quality. Water quality monitoring relies on taking a suite of measurements of ocean water. In order to measure water quality, ocean scientists use sampling equipment that measures some basic parameters of the water. The equipment's (underwater sensors) may consist of a moored instrument that takes water quality measurements continuously. These instruments can also be lowered from the surface to the bottom of the ocean limited to few meters. Some of the typical measurements which can be made with underwater sensors include temperature, salinity, density, transparency, water current and its direction, Sea Surface Temperature etc. Studies estimates that, up to 75% of the world population have settled within a sixty-kilometre distance from the shoreline by 2020, which will most likely lead to increase more anthropogenic pressures on coastal systems and to more serious environmental issues. Anthropogenic activities including industries, urbanization, extensive agriculture, tourism etc represent the major sources of pollutants which continually contribute

to exacerbate the already serious situation of coastal systems. Therefore, underwater sensors play an important role for monitoring of marine water parameters. Key research should be instituted on evaluating real-time monitoring of marine parameters and real-time processing of huge amounts of information generated. It will improve the comprehensive utilization of marine resources and marine pollution warnings, as well as marine ecological and environmental protection capabilities.

Biography

Dr. Pooja Prasenan, is working as Post-Doctoral Researcher at the Department of Electronics in Cochin University of Science & Technology (CUSAT), Kerala, India. She earned her Ph.D. from the School of Ocean Engineering & Underwater Technology (SOEUT) at Kerala University of Fisheries and Ocean Studies, Kerala, India. With over 11 years of combined teaching and research experience, she has authored more than 10 publications and a book chapter. Her research concentrates on Underwater Image Processing and Artificial Intelligence, with interests spanning in Underwater Signal Processing, Underwater Sensor Technology, Machine Learning, Neural Networks etc. She is also a member of the ISTE (International Society for Technology in Education).

About us

A confluence of Erudite and Knowledge-Seeker

Peers Alley Media

A global consortium of the scientific fraternity, scholars, educationists, industry leaders and entrepreneurs to collaborate, share ideas and knowledge to resolve challenges across medicine, science, technology and business

Our Vision

"We aim to bring the research and innovations happening across the parts of the globe to facilitate interaction, knowledge sharing and exchange. We also aim to inspire university professors, students, researchers, clinicians and entrepreneurs from across the disciplines including but not limited to clinical, medical, business, technology, healthcare and pharmaceutical fields. Our dream is to bring advancements in the Science and Technology to the mankind through our scientific gatherings and deliberations. We believe in introducing novel methods and innovative techniques in science, business and technology to provide understanding on the developments".

Our Mission

How do we serve our target groups in the scientific & business community?

- We bring the untold research accessible for many.
- Our events meet the research needs of the target groups across the academia, industry, corporates, the government, non-government agencies and public bodies.
- We Engage. Enlighten. Empower people deprived of information.
- We connect the international giants towards finding simple solutions to the complex medical and healthcare challenges of the globe.
- We unveil the unlimited research opportunities to the sections of population that is away from the developments in science and technology.
- We encourage Young and emerging researchers and scholars.
- We extend continuous education credits to boost the career and academic progress.
- We encourage start-ups in science, technology and business for the social and economic empowerment of the enthusiastic entrepreneurs.

Peers Alley Media
1126 59 Ave East, V5X 1Y9, Vancouver BC, Canada
Ph : +1 873-371-5878 | Contact us: contact@peersalley.com

INDEX

NOTES

BOOKMARK YOUR DATES

2nd Global Conclave on

FUTURE OF BIOSENSORS AND BIOELECTRONICS

2nd Euro-Global Summit on

ADVANCES IN STRUCTURAL BIOLOGY AND PROTEIN CHEMISTRY

June 2025 | London, UK