12/13 TW TUE. 星期二

08:30 A.M. - 17:40 P.M.

2022

UCSD-NCHU Joint Symposium

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ENABLE / IDCSA / SMARTer Annual Meeting

興大應用科技大樓B1國際會議廳

B1 International Conference Hall,
Applied Science and Technology Building, NCHU

AGENDA / 研討會議程

Time (US) 12th Dec. 2022	Time (TW) 13th Dec. 2022.	Speaker and Topic
16:30-16:50	08:30-08:50	**Registration**
16:50-17:10	08:50-09:10	**Opening Remarks** **Prof. Charles Tu(杜武青), Mt. Jade Professor, NCHU** **Prof. Chun-Liang Lin(林俊良), Vice President, NCHU** **Prof. Sujit Dey, UCSD**
● **UCSD-NCHU Workshop | Chair : Charles Tu(杜武青), Mt. Jade Professor, EE Department, NCHU**		
17:10-19:10	09:10-11:10	【(US)17:10-18:10 / (TW)09:10-10:10】 **Plenary Talk 1: Prof. Sujit Dey**, Jacobs School of Engineering, UCSD **Title:** Personalized and Precise Health Care using Wearables, Mobile Devices and AI. 【(US)18:10-19:10 / (TW)10:10-11:10】 **Plenary Talk 2: Assoc. Prof. Patrick Mercier**, ECE Department, UCSD **Title:** Wearable Sensors and Low-Power WiFi-Compatible Communication Circuits for Emerging IoT Applications.
19:10-19:30	11:10-11:30	**Coffee Break**
19:30-19:50	11:30-11:50	**Plenary Talk 3: Prof. Chih-Yu Wen(溫志煜),** EE Department, NCHU **Title:** Cooperative Indoor Human Localization in PIR Sensor Networks.
19:50-20:10	11:50-12:10	**Plenary Talk 4: Prof. Sying-Jyan Wang(王行健),** CSE Department, NCHU **Title**: Improving Security and Reliability of PUF Designs for IoT Applications.
20:10-21:10	12:10-13:10	**IDCSA Poster Session & Lunch**
● **IDCSA/SMARTer Workshop | Chair: Kun-Yi (Andrew) Lin(林坤儀), Division Chief, iCast, NCHU**		
21:10-21:30	13:10-13:30	**Prof. Shuen-Ei Chen(陳洵一)**, Department of Animal Science **Title:** Applications of Exfoliated Clay in Animal Production-Ammonia control.
21:30-21:50	13:30-13:50	**Prof. Tzu-Pi Huang(黃姿碧),** Department of Plant Pathology **Title:** Microbial Based Solutions to Net Zero Emission in Agriculture ~ Multiple Functional Probiotics for Agriculture and Modulation in Microbiomes
21:50-22:10	13:50-14:10	**Prof. Ching-Chou Wu(吳靖宙),** Department of Bio-industrial Mechatronics Engineering **Title:** A Microfluidic Chip Integrating Impedimetric Sensors, Immuno-Magnetic Beads, and A Dielectrophoretic Concentrator for Rapid and Ultrasensitive Detection of Foodborne Pathogens.
22:10-22:30	14:10-14:30	**Assoc. Prof. Hui-Ping Tsai(蔡慧萍),** Department of Civil Engineering **Title:** Applying Remote Sensing and A.I. Techniques for a Sustainable Environment.
22:30-22:45	14:30-14:45	**Coffee Break**

Time (US) 12th Dec. 2022	Time (TW) 13th Dec. 2022.	Speaker and Topic
● **ENABLE Workshop**		**| Chair : Zingway Pei(裴靜偉), Director, iCast, NCHU** **Chih-Feng Huang(黃智峯), Division Chief, iCast, NCHU**
22:45-23:05	**14:45-15:05**	**Assoc. Prof. Chian-Hui Lai(賴千蕙),** Graduate Institute of Biomedical Engineering **Title:** Development of a Dual-Functional / -Responsive Therapeutic Antibiotic-Loaded Nanoplatform Specifically Activated by Bacteria.
23:05-23:25	**15:05-15:25**	**Assoc. Prof. Han-Yu Hsueh(薛涵宇),**Department of Material Science and Engineering **Title:** Fabrication of Wrinkled Surfaces Composed of Ag/ZnO Nanorods as SERS-Active Devices for Detection of Pesticides.
23:25-23:45	**15:25-15:45**	**Assoc. Prof. Shu-Ping Lin(林淑萍),** Graduate Institute of Biomedical Engineering **Title:** Development of Cell-Based Biosensor Platform for Monitoring the Effect of Functional Nanocarriers as Drug Delivery System on Breast Cancer Cells.
23:45-00:05	**15:45-16:05**	**Assoc. Prof. Tung Yu-Tang(童鈺棠),** Graduate Institute of Biotechnology **Title:** To Establish a Natural Product Screening Platform Based on Endurance Exercise Patterns.
00:05-00:20	**16:05-16:20**	**Coffee Break**
00:20-00:40	**16:20-16:40**	**Asst. Prof. Yu-Hsin Tseng(曾妤馨),** Department of Life Science **Title:** Utilizing the Relationship Between Phylogeny and Metabolites to Establish a Portable and Rapid Analysis Platform for Metabolites on *Orobanche Caerulescens*
00:40-01:00	**16:40-17:00**	**Assoc. Prof. Ya-Yu Chiang (蔣雅郁),** Department of Mechanical Engineering **Title:** Establish a High-Quality Biodiesel Continuous Process and Its By-Product Application Technology Platform for Potential Energy-Distributed Generation.
01:00-01:20	**17:00-17:20**	**Asst. Prof. Chieh-Ting Lin(林玠廷),** Department of Chemical Engineering **Title:** Semi-Transparent Thin Film Solar Cells for Green House Application.
01:20-01:40	**17:20-17:40**	**Prof. Chi-Ming Hsieh(謝奇明),** International Bachelor Program of Agribusiness **Title:** Assessing International Expansion and Marketing Strategy of Innovative GABA Tea.
01:40~	**17:40~**	**Closing Remarks**

01 UCSD-NCHU Workshop

Chair :
Charles Tu(杜武青), Mt. Jade Professor, EE Department, NCHU

Plenary Talk 1

Presentation Title :
Personalized and Precise Health Care using Wearables, Mobile Devices and AI

Speaker's Name and Affiliation :
Prof. Sujit Dey
Jacobs School of Engineering, UC San Diego

City/Country : La Jolla, USA
E-mail : sdey@ucsd.edu

Brief Biography of Speaker :

Sujit Dey is a Professor in the Department of Electrical and Computer Engineering, the Director of the Center for Wireless Communications, and the Director of the Institute for the Global Entrepreneur at University of California, San Diego. He heads the Mobile Systems Design Laboratory, developing innovative technologies in mobile cloud computing, adaptive multimedia and networking, green computing and communications, and predictive and prescriptive analytics to enable future applications in connected health, immersive multimedia, and smart transportation. In 2017, he was appointed as an Adjunct Professor, Rady School of Management, and the Jacobs Family Chair in Engineering Management Leadership.

Dr. Dey served as the Faculty Director of the von Liebig Entrepreneurism Center from 2013-2015, and as the Chief Scientist, Mobile Networks, at Allot Communications from 2012-2013. He founded Ortiva Wireless in 2004, where he served as its founding CEO and later as CTO and Chief Technologist till its acquisition by Allot Communications in 2012. Prior to Ortiva, he served as the Chair of the Advisory Board of Zyray Wireless till its acquisition by Broadcom in 2004, and as an advisor to multiple companies including ST Microelectronics and NEC. Prior to joining UCSD in 1997, he was a Senior Research Staff Member at NEC C&C Research Laboratories in Princeton, NJ. He received his Ph.D. in Computer Science from Duke University in 1991.

Dr. Dey has co-authored more than 250 publications, and a book on low-power design. He holds 18 U.S. and 2 international patents, resulting in multiple technology licensing and commercialization. He has been a recipient of seven IEEE/ACM Best Paper Awards, and has chaired multiple IEEE conferences and workshops. Dr. Dey is a Fellow of the IEEE.

Abstract:

For the past six years, we have been developing a platform P3.ai which enables personalized and precise health care of patients using existing off-the-shelf devices and AI, offering autonomous continuous engagement with patients resulting simultaneously in better health outcomes, reach and care efficiency. This talk will describe development of the platform for two broad areas – virtual chronic care and telerehabilitation.

We will first describe our work with hypertension. Utilizing data remotely collected by existing devices like smart watches/activity trackers, home BP monitors and our mobile app, P3.ai uses machine learning techniques to identify the complex relationships between BP and lifestyle factors in order to obtain precise insights about the exact causes of BP for an individual hypertension patient. It provides precise, personalized and proactive lifestyle recommendations to the patient through an interactive and engaging patient app to enable them to achieve their BP goals. It also provides a dashboard for care providers to easily track patient outcomes and provide timely notifications only when physician intervention is needed, along with recommended precise care pathways. P3.ai is a cloud-based fully autonomous system with no health coaches and minimal physician/care team interventions needed, and hence enables highly cost-efficient scalable deployments.

Next, we will briefly discuss our work on developing a “virtual physical therapist” to facilitate low-cost, continuous and remote rehabilitation for patients, utilizing patient’s existing mobile device, and machine vision and machine intelligence, to enable real-time monitoring, guidance and recommendations, while letting care providers track remotely the well-being, progress and compliance of patients. We will end the talk briefly looking at P3.ai roadmap, which includes extension to other chronic conditions, like diabetes, depression, and anxiety, and post-rehabilitation and post-surgery monitoring and guidance.

Plenary Talk 2

Presentation Title :

Wearable Sensors and Low-Power WiFi-Compatible Communication Circuits for Emerging IoT Applications

Speaker's Name and Affiliation :

Dr. Patrick Mercier

Associate Professor, Electrical and Computer Engineering
PI, Energy-Efficient Microsystems Lab
Co-Director, Center for Wearable Sensors
Site Director, Power Management Integration Center
University of California, San Diego

City/Country : La Jolla, USA

E-mail : pmercier@ucsd.edu

Brief Biography of Speaker :

Patrick Mercier is an Associate Professor of Electrical and Computer Engineering and co-founder/co-director of the Center for Wearable Sensors and Site Director of the Power Management Integration Center at UCSD. He received his Ph.D. degree from MIT. Prof. Mercier has received numerous awards, including the NSF CAREER Award, the Biocom Catalyst Award, the UCSD Academic Senate Distinguished Teaching Award, the DARPA Young Faculty Award, the Beckman Young Investigator Award, the International Solid-State Circuits Conference (ISSCC) Jack Kilby Award, amongst others. He has published over 180 peer-reviewed papers in venues such as Science, Nature Biotechnology, Nature Biomedical Engineering, Nature Communications, ISSCC (25 papers), Advanced Science, and others. His research interests include the design of energy-efficient mixed-signal systems, RF circuits, power converters, and sensor interfaces for wearable, medical, and mobile applications.

Abstract:

Wearable and IoT devices hold considerable promise to diagnose, monitor, and treat various medical conditions and/or track the real-time status of humans, industrial plants, homes, or general environments. However, most current generation devices only monitor a limited number of parameters that are, in many cases, only peripherally related to many health conditions or enterprises. Furthermore, many such devices are large, bulky, and rigid, thereby precluding seamless integration into daily life, or offer poorer-than desired battery life, requiring expensive re-charge or replacement activities. This presentation will discuss developments of new sensor technologies that provide more actionable data and engineering of supporting electronic infrastructure to condition, digitize, and wirelessly communicate data in an extremely energy efficient manner to enable these exciting new applications.

Plenary Talk 3

Presentation Title :

Cooperative Indoor Human Localization in PIR Sensor Networks

Speaker's Name and Affiliation :

Prof. Chih-Yu Wen (溫志煜)

Department of Electrical Engineering, National Chung Hsing University

City/Country : Taichung, Taiwan

E-mail : cwen@dragon.nchu.edu.tw

Brief Biography of Speaker :

Chih-Yu Wen (S'03–M'05–SM'15) received the B.S.E.E. and M.S.E.E. degrees in electrical engineering from National Cheng Kung University, Tainan, Taiwan in 1995 and 1997, respectively. He also received the M.S.E.E. degree and the Ph.D. degree in electrical engineering from the University of Wisconsin-Madison, USA, in 2002 and 2005, respectively. He joined the Department of Electrical Engineering at National Chung Hsing University, Taichung, Taiwan in 2006, where he is now a Lifetime Distinguished Professor and University Librarian. His current research interests include wireless communications, biomedical signal processing for health monitoring, and distributed networked sensing and control. Prof. Wen is a senior member of IEEE and a member of Chinese Institute of Engineers. Since January 2018, he has served as an Associate Editor of IET signal processing. He received the National Innovation awards – Institute for Biotechnology and Medicine Industry in 2016, 2018 and 2019 for contributions to remote rehabilitation and smart medical devices. Prof. Wen and co-authors received the Best Paper Award at the 2020 Taiwan Telecommunications Annual Symposium, for their paper "Non-Contact Switching Faucet Structure and Its Controlling Method."

Abstract:

In recent years, indoor localization has become a key area for Internet of Things (IoT) applications, especially in a mall, a hospital or a big office environment. Although several approaches have been proposed for localization applications (e.g., systems with a camera, wearable devices, or ultrasonic sensors), Pyroelectric Infrared (PIR) sensors provide a useful trade-off between privacy and estimation accuracy in indoor localization systems. Since a binary PIR sensor detects only the presence of a human motion in its field of view (FOV) without location information, utilizing the information of overlapping FOV of multiple sensors can be useful for localization. In this talk, I will introduce the design principles of a PIR detector and sensing signal processing algorithms based on the characteristics of the PIR sensor. The designed PIR detector can be further applied as a sensor node to create a non-wearable cooperative indoor human localization system. To improve the system performance, signal processing algorithms and refinement schemes (i.e., the Kalman filter, a Transferable Belief Model, and a TBM-based hybrid approach (TBM + Kalman filter)) are implemented and compared. Experimental results indicate system stability and improved positioning accuracy, thus providing an indoor cooperative localization framework for PIR sensor networks.

Plenary Talk 3

Presentation Title :

Improving Security and Reliability of PUF Designs for IoT Applications

Speaker's Name and Affiliation :

Prof. Sying-Jyan Wang (王行健)

Department of Computer Science and Engineering, National Chung Hsing University

City/Country : Taichung, Taiwan

E-mail : sjwang@cs.nchu.edu.tw

Brief Biography of Speaker :

Sying-Jyan Wang (Member, IEEE) received the B.S. degree in electrical engineering from National Taiwan University, Taiwan, R.O.C., in 1984, and the Ph.D. degree in electrical engineering from Princeton University in 1992. From 1984 to 1986 he was a R.O.T.C. Officer with Air Force, Taiwan. From 1986 to 1987, he was a Teaching Assistant with the Department of Electrical Engineering, National Taiwan University. From 1989 to 1990, he was a Consultant with AT&T Bell Laboratories, Holmdel, NJ, USA. Since 1992, he has been with the Department of Computer Science and Engineering, National Chung Hsing University (NCHU), Taiwan, where he is currently a Professor. From 1999 to 2005, he served as the Chair for the Department of Computer Science and Engineering, NCHU. His research interests include VLSI design, digital testing, and the computer-aided design of VLSI systems.

Abstract:

The Physical Unclonable Function (PUF) has been proposed for the identification and authentication of devices and cryptographic key generation. A strong PUF provides an extremely large number of device-specific challenge-response pairs (CRP) which can be used for authentication. To be used in IoT applications, a PUF design must be unpredictable and reliable. However, the CRP mechanism is vulnerable to modeling attack, which uses machine learning (ML) algorithms to predict PUF responses. Many methods have been developed to strengthen strong PUFs; however, recent studies show that they are still vulnerable under refined ML algorithms with enhanced computing power. Since the uniqueness of PUFs comes from process variation, the responses may be sensitive to environmental conditions, which restricts the application in IoT devices. Unfortunately, methods used to improve PUF reliability also makes the design more predictable. In this talk, we will discuss how to deal with both issues with the help of ML based techniques. The proposed method is compatible with hardware strengthening schemes to provide even better protection for PUFs.

02 IDCSA/SMARTer Workshop

Chair :
Kun-Yi (Andrew) Lin(林坤儀), Division Chief, iCast, NCHU

Presentation Title :

Applications of Exfoliated Clay in Animal Production-Ammonia Control

Speaker's Name and Affiliation :

Prof. Shuen-Ei Chen (陳洵一)

Department of Animal Science, National Chung Hsing University

City/Country : Taichung, Taiwan

E-mail : shueneic@dragob.nchu.edu.tw

Brief Biography of Speaker :

Professor, Department of Animal Science, National Chung Hsing University
Post-doctoral Associate; Baylor College of Medicine,
Ph.D; Texas A&M University
MS; Ohio State University
BS; National Chung Hsing University

Abstract:

An exfoliation process of natural clays renders the silicates in a highly dispersed form of nanometer platelets (ca. 80 × 80 × 1 nm), high surface areas (ca. 720 m2/g), cationic exchange capacity (1.20 mequiv/g), and ionic charges (ca. 20 000 ions/platelet). These unique characteristics promote the silicate nano-clay NSCP with a high binding affinity to adhere to the surface of bacteria, interact with viruses, and absorb toxins. Past studies with the silicate nano-clay have validated its biosafety and anti-microbial and anti-viral efficacy. We then applied the nano-clays in animal production and demonstrated its functionality as an effective feed supplement for mycotoxin absorption and growth promotion in chickens. Current studies with the silicate nano-clay further confirmed its efficiency of ammonia control in broiler production as a dietary supplement and an absorbent for environmental use.

Presentation Title :

Microbial Based Solutions to Net Zero Emission in Agriculture ~ Multiple Functional Probiotics for Agriculture and Modulation in Microbiomes

Authors' Names and Affiliation

Tzu-Pi Huang and Jenn-Wen Huang

Department of Plant Pathology, National Chung Hsing University; Plant Health Care Master and Doctoral Degree program, Academy of Circular Economy National Chung Hsing University.

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Brief Biography of Speaker :

Dr. Tzu-Pi Huang is currently a professor in the Department of Plant Pathology at National Chung Hsing University (NCHU) in Taichung, Taiwan. She is also the Director of four Master and Doctoral Degree programs (Plant Health Care, Biological and Sustainable Technology, Specialty Crops and Metabolomics, and International Precision Agribusiness Development) in Academy of Circular Economy at NCHU. She received her Ph. D from the University of Wisconsin-Madison. Her research foci are the development of microbial agents for the control of plant diseases and revealing the molecular mechanisms of biocontrol particularly targeting on biofilm formation and microbial communication.

Abstract:

As global climate change exacerbate the impact on crop cultivation and food security, the Conference of the Parties to the United Nations Framework Convention on Climate Change has set a mission of "net zero emission" by 2050. In Taiwan, to achieve net zero emission in agriculture, the strategies are implemented through the reduction of emission, the enhancement of carbon sink, the recycling of agriculture by-products, and the promotion of green economy. Here, we proposed a Microbial Based Solutions for reducing the use of chemical fertilizers and pesticides, the increase of carbon sink, and the value-added application of agriculture by-product. Our transdisciplinary team discovered two *Bacillus*-based probiotics (*Bacillus licheniformis* EC34-01, and *Bacillus subtilis* 151B1), and demonstrated their high potential for application in crop health care, bioremediation of agricultural pollutants, livestock farming, and aquaculture. *B. licheniformis* EC34-01 and *B. subtilis* 151B1 were isolated from the plant rhizosphere in Taiwan. The microbial agents of two strains were developed in liquid and powder formulations and spray-coating granules using a pilot plant and industrial-scale facilities to assess their efficacy in multi-industry applications. Our results indicated that both strains could promote growth of various plants including strawberry, tea, and cucumber plants, and suppress plant diseases such as Fusarium wilt and damping off on cucumber seedlings. They also possessed plant growth promoting traits including production of protease, amylase, cellulase, lipase and IAA, and phosphorus-solubilizing activity.

B. subtilis 151B1 also could produce C14- and C15- family surfactins and C14- and C15- family iturin A to trigger apoptotic-like cell death, reduce mitochondrial membrane potential and interfere with the energy metabolism of the pathogen. *B. subtilis* 151B1 and *B. licheniformis* EC34-01 induced the expression of plant defense genes such as PAL, POX and PR1a on cucumber seedlings. Both strains were great biofilm formers, and could colonize well on plant roots. They also could enhance the tolerance of plants such as pak-choi to drought and flooding. Additionally, our work demonstrated the use of B. subtilis and B. licheniformis exert numerous beneficial effects on animals including hogs, chickens, tilapia, milkfishes, and whiteleg shrimp. These two probiotics are good alternatives for improving feed utilization, leading to enhanced growth performance, stress response, immune response, disease resistance, and meat quality. Findings also suggested their potential in improvement of farm and water quality for sustainable livestock farming and aquaculture. Moreover, both probiotics exhibited activities in degradation of pesticides malathion and deltamethrin, and a fungicide tricyclazole. The influence of introducing these Bacillus-based probiotics on the microbiome of the plant rhizosphere and fish guts will also be discussed in this presentation.

(The contents presented in part were published in **Asia Pacific Biofertilizers and Biopesticides Information Platform/ Food and Fertilizer Technology Center for the Asian and Pacific Region** Aug. 29, 2022. https://apbb.fftc.org.tw/article/263)

Presentation Title :

A Microfluidic Chip Integrating Impedimetric Sensors, Immuno-Magnetic Beads, and A Dielectrophoretic Concentrator for Rapid and Ultrasensitive Detection of Foodborne Pathogens

Speaker's Name and Affiliation :

Prof. Ching-Chou Wu (吳靖宙)
Department of Bio-industrial Mechatronics Engineering,
National Chung Hsing University

City/Country : Taichung, Taiwan
E-mail : ccwu@dragon.nchu.edu.tw

Brief Biography of Speaker :

Dr. Ching-Chou Wu is a professor in the Department of Bio-industrial Mechatronics Engineering (BIME), at National Chung Hsing University (NCHU). He received his Ph.D. degree from the Institute of Biomedical Engineering, National Cheng-Kung University, Taiwan in 2003. Then, he served as a postdoctoral fellow at Tohoku University, Japan from 2003 to 2005. Dr. Wu joined NCHU in 2005 as an Assistant Professor and was promoted to Professor in 2014, then Distinguished Professor in 2018. Dr. Wu is also the Chair of BIME in 2017-2020 and the President of the Association of Chemical Sensors in Taiwan (ACST) from 2018-2020. He is the faculty of the NCHU Innovation and Development Center of Sustainable Agriculture. Dr. Wu has more than 50 peer-reviewed publications as well as 21 patents. He currently serves as a stirring member of the Asian Conference of Chemical Sensors, and the editorial board member of the journals, Critical Reviews™ in Biomedical Engineering (Begell House), Biosensors (MDPI), Biomedical Microdevices (Springer), and Biosensors and Bioelectronics:X (Elsevier).

Abstract:

Foodborne pathogenic bacteria have become a global health threat. Most present immunoassays need the several-hour culturing pretreatment to amplify bacterial numbers for detection. Developing a rapid, high throughput and sensitive method to detect foodborne pathogens is essential for food safety. This study adopted immuno- or aptamer-modified immunomagnetic beads (IMB or AMBs) to capture Salmonella from actual samples. After collecting AMB@*Salmonella* complexes with a magnet, the AMB@*Salmonella* complexes were suspended in pure water and conducted in a microfluidic chip, consisting of top-bottom opposite electrodes and a 60 m-high microchannel. During the 25 μL/min flow transportation, positive dielectrophoresis (pDEP) (7.5 Vpp, 50 kHz) was applied for 3 min to concentrate the AMB@*Salmonella* complex in the micro-holes (10 μm in depth) of bottom-side working electrodes. The electrochemical impedance spectroscopy was used to quantify the pDEP-concentrated AMB@*Salmonella* concentration. The negatively charged AMB@*Salmonella* complexes could significantly repel the negatively charged ferrocyanide/ferricyanide mediators from the electrode interface, which increased the electron-transfer resistance during EIS measurement. The microfluidic device integrating pDEP concentration and EIS detection can reach a detection limit of 1 CFU/mL. The device has great promise to construct a rapid and ultrasensitive platform for detecting pathogenic concentrations without culturing pretreatment.

Presentation Title :

Applying Remote Sensing and A.I. Techniques for a Sustainable Environment

Speaker's Name and Affiliation :

Assoc. Prof. Hui-Ping Tsai (蔡慧萍)

1. Department of Civil Engineering, National Chung Hsing University, Taichung, Taiwan
2. Innovation and Development Center of Sustainable Agriculture, National Chung Hsing University, Taichung, Taiwan

City/Country : Taichung, Taiwan
E-mail : huiping.tsai@nchu.edu.tw

Brief Biography of Speaker :

Hui Ping Tsai received an M.S. degree in bioenvironmental systems engineering from the National Taiwan University, Taipei, Taiwan, in 2004 and a Ph.D. degree in geography from the University of Florida, Gainesville, FL, USA, in 2012. She is an associate professor with the Department of Civil Engineering and a member of the Innovation and Development Center of Sustainable Agriculture at National Chung Hsing University, Taichung, Taiwan. Her research interests include remote sensing, land use and land cover change (LULCC), climate variability, and interaction between humans and the environment.

Abstract:

As the global climate changes so fast, with many impacts worldwide, it is necessary to understand Taiwan more deeply to maintain environmental sustainability for human well-being. According to the recent remarks of COP 27 (Conference of the Parties), sustainable land use has been recognized as essential to meeting climate targets. Therefore, the current study utilizes advanced remote sensing data from satellites to investigate the land cover change and to study the temporal trajectory of land cover in central Taiwan. Specifically, two townships, Mingjian and Lugo, are studied based on satellite images for their land cover change from 2008 to 2021. Additionally, deep-learning techniques were applied to image classification, and specific landscape metrics were employed to investigate the underlying spatial structure changes.

ENABLE Workshop

03

Chair :

Zingway Pei(裴靜偉),
Director, iCast, NCHU

Chih-Feng Huang
(黃智峯), Division Chief,
iCast, NCHU

Presentation Title :

Development of a Dual-Functional / -Responsive Therapeutic Antibiotic-Loaded Nanoplatform Specifically Activated by Bacteria

Speaker's Name and Affiliation :

Assoc. Prof. Chian-Hui Lai (賴千蕙)
Graduate Institute of Biomedical Engineering, National Chung Hsing University (NCHU)

City/Country : Taichung, Taiwan
E-mail : chianhuilai@dragon.nchu.edu.tw

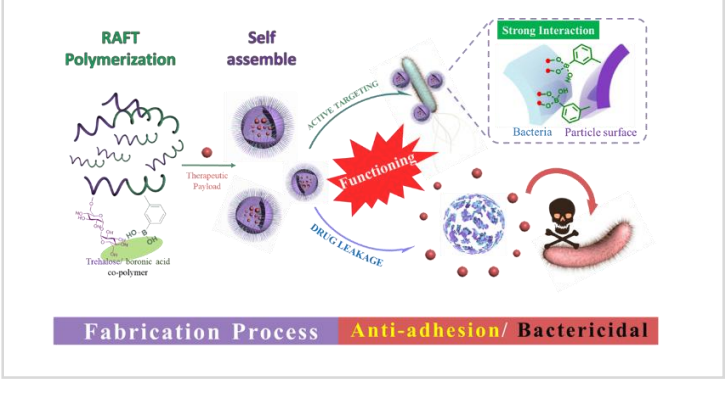
Brief Biography of Speaker :

Dr. Chian-Hui Lai is an Associate Professor in Graduate Institute of Biomedical Engineering in National Chung Hsing University (NCHU), Taichung, Taiwan. Prior to joining NCHU, she was an assistant professor (2016-2017) in Department of Medicinal and Applied Chemistry in Kaohsiung Medical University, Taiwan and she has been an adjunct professor until now. She had three post-doctoral trainings at Genomics Research Center, Academia Sinica, Taiwan (2015-2016); Department of Biomolecular Systems, Max Planck Institute of Colloids and Interfaces, Potsdam, Germany (MPIKG, 2013-2015); and Department of Chemistry, National Tsing-Hua University, Taiwan (2012-2013). In 2011-2012, she was also a visiting scholar in MPIKG, Germany. She received B.S. degree from National Chang Hua University of Education (2006) and Ph.D. degree from National Tsing Hua University (2012), Taiwan, both in Chemistry. Dr. Lai's lab focuses on synthesis and design specific targeting anti-cancer drug delivery and releasing system. Besides, she uses organic and analytical chemistry concept to functionalize nanoparticle for multiple biomedical applications.

Abstract:

In this talk, we would like to show our recent progress to prepare a dual-functional and responsive therapeutic antibiotic-loaded nanocarrier which is made by a synthetic polymer of boronic acid (BA) and trehalose (a di-saccharide sugar) units. The preparation would be brief discussed with NMR, FTIR, DLS and TEM data. Besides, a BA modified magnetic nanoparticle (BA@MNP) is also prepared to test its bacterial capture ability.

Ref: J.-W. Chen, T.-C. Wu, W. Liang, J.-J. Ciou, C.-H. Lai *; "Boronates as hydrogen peroxide–reactive warheads in the design of detection probes, prodrugs, and nanomedicines used in tumors and other diseases" Drug Delivery and Translational Research .2022. ASAP



Presentation Title :

Fabrication of Wrinkled Surfaces Composed of Ag/ZnO Nanorods as SERS-Active Devices for Detection of Pesticides

Speaker's Name and Affiliation :

Assoc. Prof. Han-Yu Hsueh (薛涵宇)
Department of Material Science and Engineering, National Chung Hsing University, Taichung 40227, Taiwan.

City/Country : Taichung, Taiwan
E-mail : hyhsueh@nchu.edu.tw

Brief Biography of Speaker :

Han-Yu Hsueh received his PhD in Chemical Engineering from National Tsing Hua University (Taiwan) under the supervision of Professor Rong-Ming Ho. He did his postdoctoral research in Rong-Ming Ho's lab for the military service starting and then joined Professor Alfred J. Crosby's group as a visiting scholar, working in University of Massachusetts Amherst (USA). After that, He joined TSMC in Taiwan as a R&D principal engineer for advanced technology module development. In August of 2016, Dr. Hsueh joined the faculty of NCHU in the Department of Materials Science and Engineering as an assistant professor and got promoted to associate professor in February 2021. His current research interests are polymeric hybrid materials and interfaces for applications, including bioinspired materials, surface wrinkling, optical-mechanical sensors, and stimuli-responsive materials.

Abstract:

In this study, we try to create a novel and sensitive surface-enhanced Raman scattering (SERS) device, composed of wrinkled surfaces with ZnO nanorods doped with Ag nanoparticles, for quick and accurate detection of pesticides and hormones in the environment. SERS has been explored as a powerful technique for tracing and monitoring dynamic molecular processes. A ZnO precursor solutions will be coated onto the PS sheet, followed by hydrothermal method to obtain ZnO rods. After photoreduction method to reduce silver nanoparticles, ZnO nanorods decorated with Ag nanoparticles on a PS sheet will be synthesized. Through further thermal treatment for dynamic thermal contraction process, wrinkled PS with ZnO nanorods doped with Ag nanoparticles should be generated, serving as wrinkled Ag/ZnO SERS-active devices. Combination of electromagnetic enhancement of Ag nanoparticles and charge transfer effect of ZnO, the wrinkled Ag/ZnO SERS-active devices should give good SERS enhancement effect and higher sensitivity. In addition, the 3D wrinkled structure can provide high-density hotspots, compared with 2D thin film structure. It is expected that the wrinkled Ag/ZnO SERS-active devices will possess excellent SERS properties, such as high sensitivity, stability and reusability.

Presentation Title :

Development of Cell-Based Biosensor Platform for Monitoring the Effect of Functional Nanocarriers as Drug Delivery System on Breast Cancer Cells

Speaker's Name and Affiliation :

Assoc. Prof. Shu-Ping Lin (林淑萍)
Graduate Institute of Biomedical Engineering, National Chung Hsing University

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Brief Biography of Speaker :

Dr. Shu-Ping Lin was a visiting research associate in Prof. Dr. Themis Kyriakides's lab at Yale University (2006–2007) and a visiting associate professor in Prof. Dr. Qiangfei Xia's lab, Department of Electrical and Computer Engineering, University of Massachusetts Amherst, MA, USA (2022). She worked as a postdoctoral researcher at the Institute of Atomic and Molecular Sciences, Academia Sinica (2008-2009), and an independent researcher at Industrial Technology Research Institute (2009-2010). In 2010, she joined Graduate Institute of Biomedical Engineering, National Chung Hsing University, as an assistant professor. She was promoted as an associate professor in 2016. She received the Project for Excellent Junior Research Investigators, Ministry of Science and Technology of Taiwan in 2022. She has published papers in reputed journals, such as Advanced Functional Materials, Matter, NanoToday, Biomaterials, ACS Applied Materials & Interfaces, ACS Applied Nano Materials, Materials Letters, Nanotechnology, etc. Her present research is centered on bioelectronics for neuromorphic emulation, FET devices for biosensing, neuronal interfaces, biocompatible nano/micro biosensors, biocompatible and surface functional modification, and biopolymers for cell and tissue engineering.

Abstract:

With the rapid emerging research of nanotechnology and polymer engineering in biomedical applications, scientists start to develop state-of-the-art diverse biosensing platforms. Here, in-vitro cell-based biosensor (CBB) was fabricated using nano/micro technologies to electrophysiologically observe the effects of drug treatment on human breast cancer cells. The green process was applied to transfer biomass into bio-monomers for further synthesizing drug-embedded nanocarriers. With the aid of CBB platform, the real-time electrical signals can be applied to monitor the therapeutic efficacy of the nanocarriers in drug delivery system and screening large libraries of potential drugs for cancer treatment. Moreover, our pilot study indicates that our CBB could be a feasible platform to reduce/replace the use of animals based on the "Three R principles" in animal-based research in the future.

Presentation Title :

To Establish a Natural Product Screening Platform Based on Endurance Exercise Patterns

Speaker's Name and Affiliation :

Assoc. Prof. Tung Yu-Tang (童鈺棠)
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Brief Biography of Speaker :

Tung Yu-Tang has been an associate professor at the Graduate Institute of Biotechnology, National Chung Hsing University. My research interesting is (1) To establish animal models of disease; (2) Exercise and Nutrition; (3) Genomics, proteomics, metabolomics and gut microbiome applications. Up to date, I have published over 113 research scientific papers (SCI) and 2 patents (Taiwan and USA). The total number of cited papers over the years has reached 1910, and the H-index is 27.

Abstract:

As competitive sports become increasingly competitive, it has become common for athletes to use nutritional supplements during training or competition in the hope of enhancing athletic performance. With the increasingly fierce competition in competitive sports, it is a common situation for athletes to use nutritional supplements during training or competition in order to improve sports performance. In addition to the traditional research direction of improving sports performance in the field of sports nutrition, more Scholars have begun to explore aspects such as improving immune function, inflammatory response, and oxidative stress. Chinese herbal medicines have undergone thousands of years of "human-like experiments" in the East, often claiming that they have physiological functions or effects such as anti-inflammatory, enhancing immunity, protecting liver, lowering blood lipids or lowering blood sugar. However, the evidence of modern science is often insufficient, so as to mislead the public, so it is urgent to improve it as soon as possible. The development, modernization and scientificization of Chinese herbal health food are very important issues in Taiwan today in terms of basic research, economy and society. In the past, the quality of Chinese herbal medicine was often mixed, the ingredients were unclear, and there was no screening platform in line with modern medicine to test its activity and the function of clinical trials to confirm its efficacy. Naturally, it was difficult for countries such as Europe and the United States to accept it. Therefore, in the scientific research of Chinese herbal medicine or the research and development of healthy food, we must effectively improve the quality of Chinese herbal medicine and control its composition through metabolite profiling analysis. At the same time, we must establish an experimental screening platform with modern medical methods to evaluate clinical efficacy. On the other hand, many herbal remedies often fail to be effectively compared and replicated, resulting in a lack of consistent and systematic evaluation of each other.

At this time, if we can apply a kind of health food that has been circulated among the people for a long time, use modern biomedical and molecular biology methods to systematically explore its functional curative effect, and establish a set of overall qualitative and quantitative functional health food. The validity standard is more likely to be recognized by Europe and the United States, with a view to entering the international market faster. Therefore, Chinese herbal medicine has gradually received attention in the field of sports, and has been widely used in the field of sports science. Therefore, this study analyzed and selected extracts with higher active ingredients in nature, and then conducted experiments on animals, and apply them to vigorous endurance sports, hoping to use the research results as coaches and athletes in nutritional supplementation programs to make training more effective and healthier for athletes.

Presentation Title :
Utilizing the Relationship Between Phylogeny and Metabolites to Establish a Portable and Rapid Analysis Platform for Metabolites on *Orobanche Caerulescens*

Speaker's Name and Affiliation :
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Brief Biography of Speaker :

Education:
National Taiwan Normal University, Department of Life Science, Ph.D
National Chung Hsing University, Department of Life Science, M.S.

Speaker's Name and Affiliation :
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Brief Biography of Speaker :

Education:
National Taiwan University, Institute of Ecology and Evolutionary Biology, PhD
National Sun Yat-Sen University, Department of Biological Science, MS
National Sun Yat-sen University, Department of Biological Science, BS

Experience:
Academia Sinica, Biodiversity Research Center, Postdoctoral Fellow
Royal Botanic Garden Edinburgh & University of Edinburgh, Postdoctoral Fellow

Abstract:

Orobanche caerulescens is a plant belonging to the family Orobanchaceae, and needs to parasitize upon the roots of Artemisia *capillaris*. Obviously, the *O*. *caerulescens* are discontinuously distributed. This distribution pattern has always been a topic of concern in biogeography, but the distribution pattern and population structure in Taiwan have not to be clarified. The pharmacological studies have pointed out that the main components of *O*. *caerulescens* are phenylethanoid glycosides (PhGs), which enhance liver protection, anti-oxidation, anti-aging, neuro-protection and immune regulation. The Echinacoside acts as a reference standard. In Taiwan, *O*. *caerulescens* is considered neither food nor medicine. The conventional Chinese physician should not be using it; however, it has long been used by the indigenous in Taiwan. It is also cultivated and merchandised by private institutions. It is very important to establish the statistical database of its implant components as a referent legal grounding. This project will collect *O*. *caerulescens* from different locations in Taiwan, and compare the relationship of environmental factors and metabolites, in order to set up a baseline for further cultivation and pharmaceutical use. We would like to study its metabolic products using a portable mass spectrometer developed by our Chemical department. The matrix-assisted ionization method is applied to directly study the subject's metabolic products without affecting from the subject's biological interventions. Not only simplifies the analysis procedure, the portable mass spectrometer also works outside the laboratory. It allows us to collect samples and get the initial test result on site. This project examines a potential medicinal plant using a novel analytical tool and Biology. It is highly competitive globally in both fundamental Biology study and industrial application.

Presentation Title :

Establish a High-Quality Biodiesel Continuous Process and Its By-Product Application Technology Platform for Potential Energy-Distributed Generation

Speaker's Name and Affiliation :

Assoc. Prof. Ya-Yu Chiang (蔣雅郁)
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Brief Biography of Speaker :

Dr. Ya-Yu Chiang is an Associate Professor at the Department of Mechanical Engineering, National Chung - Hsing University in Taiwan. She obtained her doctorate from the Department of Biochemical and Chemical Engineering, Technische Universität Dortmund (Germany). Her current research interests include fluidic manipulation, biomimicry, multiphase mass transfer, and mechanics. Dr. Chiang is recognised with Excellent Young Scholars and Taiwan Future Tech Awards from National Science and Technology Council (NSTC). She has also received several awards, including an Excellent Young Engineering Professors Award from Chinese Society of Mechanical Engineering (CSME), Gold Medal in the Taiwan Innotech Expo Innovation Patent Competition, National Chung Hsing University Brilliance Award, Outstanding Industry-Academia Cooperation Award, Academic Research Performance Incentives, College of Engineering Outstanding Mentor Award, College of Engineering Outstanding Service Award, Honorable mention Young Scholars Award of Taiwan Comprehensive University System.

Abstract:

Facing the daunting challenges of a global energy crisis, Taiwan needs to enhance its energy security to reduce dependence on imported crude oil and ensure stable domestic fuel and food production while continuing the drive toward carbon neutrality and a circular economy. However , even in a comprehensive smart grid system, solar and wind energy are still limited. Biodiesel converted directly from liquid fuels and with valuable coproducts may become the source of the next generation of electricity. In response to the challenges as mentioned above, the innovative, safe, automated continuous flow production set-up plan is developed in this Enable Project. This system may provide possible alternatives and transform energy suppliers (central plant) into safer distributable energy (distributed power generation) to achieve a sustainable development model.

We developed a novel high-efficiency transesterification reactor and downstream purification unit operators for continuous biodiesel production. The system carries out a high-quality mixing capability reactor for soybean oil/menthol transesterification, 2-3 sets of downstream purification unit operators for biodiesel/glycerol separation, acid washing and menthol extraction. Thus, high-purity biodiesel products, co-product (crude glycerol), and excess methanol recycling achieve green manufacturing goals. Compared to bench-scale extraction experiments performed in a 250-mL agitating beaker, the developed system conducts approximately 150 times faster at a similar transesterification yield.

The downstream purification unit operators achieve biodiesel and crude glycerol continuous separation in 93% and 77% purity (in mass friction). Extensive amounts of crude glycerol were also generated as a side product for biodiesel manufacturing. Crude glycerol and castor oil are bio-based polyols to prepare polyurethane (PU) foams. The results indicate that crude glycerol/castor oil molar ratios could be set from 0/1 to 1/1 to form the intact foam shell. Increasing the crude glycerol ratio reduces the reaction time and enhances chemical resistance and mechanical properties. Bio-based PU foams could absorb biodiesel and diesel at various amounts and rates. The side product has the potential to use biodiesel recovery from raw wastewater.

Presentation Title :

Semi-Transparent Thin Film Solar Cells for Green House Application

Speaker's Name and Affiliation :

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Brief Biography of Speaker :

Dr Chieh-Ting Lin received his BSc from National Cheng Kung University in Taiwan, together with exchange programs at Temple University in U.S and Osaka University in Japan. He then continued his MRes and PhD under the supervision of Professor Martyn Mclachlan and Professor James Durrant at Imperial College London in U.K. His project focused on enhancing the stability and efficiency of perovskite solar cells and probing the origin of these enhancements via material and photophysics characterisations. He then worked on the development of stable organic photocathodes as a research associate at Imperial College London. Later on, he moved to Gwangju Institute of Science and Technology and focused on large-scale perovskite and organic solar cells. He is now an assistant professor at National Chung Hsing University, Department of Chemical Engineering, and his research focuses on single crystal perovskite solar cells and all polymer organic solar cells.

Abstract:

At present, greenhouse planting technology has been widely used in the cultivation of plants. If further consideration is given to the government's 2050 net-zero carbon emissions and the development of green energy, the integration of solar cells and greenhouse facilities with novel optoelectronic materials can provide electricity for smart agricultural facilities and achieve the goal of zero carbon emission. However, the greenhouse integrated with solar cell must let the light needed by plants pass through; thus, semitransparent solar cells come out as a good solution. The chlorophyll of plants required blue light (400nm-500nm) and red light (600nm-700nm) for photosynthesis, and the application of far-infrared light (700nm-850nm) makes plants produce shade avoidance response (Shade avoidance response), thereby promoting plant growth. In this study, we will investigate the semitransparent solar cells with optoelectronic materials, and integrate these solar cells to the greenhouse to provide the electricity required for the greenhouse. Due to the tunable light absorption range of these novel optoelectronic materials, the semitransparent solar cells can modulate sunlight penetrating to the greenhouse to control plant growth rates.

Presentation Title :

Assessing International Expansion and Marketing Strategy of Innovative GABA Tea

Speaker's Name and Affiliation :

Chi-Ming Hsieh and Sze Wai (Alex) Ng

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Brief Biography of Speaker :

Chi-Ming Hsieh is Professor in the International Bachelor Program of Agribusiness at National Chung Hsing University, Taiwan. He earned the Ph.D. from Michigan State University. His main research/teaching interests include agribusiness management, consumer behavior, and business model. He engages in collaborative research and serves as reviewers of academic journals.

Abstract:

The annual output of tea leaf is around 13,400 metric tons, and the export was only approximately 8,000 metric tons per year; however, the total export value of tea-leaf products from Taiwan accounted for 0.3 billion, and total exports of tea related products (tea beverage, tea food, etc.) was worth US 5 billion according to the Council of Agriculture (2018). Facing the difficulties and bottlenecks including insufficient machinery in some tea factories or negative impacts caused by climate and environmental changes, it is critical to transforming to innovative and value-added tea industry for future sustainable development of Taiwan's tea industry among Taiwanese tea growers. The GABA tea which contains gamma-aminobutyric acid (GABA) was first produced in Japan and is better produced in Taiwan, but an innovative type of tea for consumers in most other countries, improving sleep quality, assist the treatment of anxiety disorders and boost the immune system. This study aimed to explore the consumers' willingness-to-pay (WTP) for innovative GABA tea in India tea market. Data were collected by employing a mix of qualitative and quantitative approaches including in-depth interview, and structured questionnaire survey. Specifically, six attributes and levels (tea type, origin of tea, tea flavor, organic certificate, product type, and additional cost for GABA tea) were created and applied in the Choice Experiment method along with consumption behavior and socioeconomic variables. The results showed that 1) India respondents prefer to drink GABA Oolong tea, prefer imported tea, different flavor, organic certificate, also prefer loose-leaf tea; 2) Three hypothetical scenarios were designed as guidelines for the future GABA tea marketing strategies whereas GABA Oolong tea was the most preferred scenario by India respondents (64.82% additional cost of WTP), followed by GABA Green tea (60.26 % additional cost of WTP), and GABA Black tea (56.06 % additional cost of WTP). This study generates useful information by displaying potential marketing strategies of innovative GABA tea in India for future guidelines.

Keywords: GABA tea, Choice Experiment, Innovation, Willingness-to-pay, Indian tea growers

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