LECTURE 41

Dr. Chu Duc Trinh

Rector, University of Engineering and Technology, Vietnam National University, Hanoi

Date: 2025.11.10

INTRODUCTION

Prof. Chu Duc Trinh was visiting from November 7 to November 9 to participate Tamkang University's 75th Anniversary Diamond Jubilee. He has also been invited to serve as the keynote speaker for Tamkang Clament and Carrie Chair (the Panda Lecture) organized by the Department of Mechanical and Electro-Mechanical Engineering of the College of Engineering on November 10. Chu Duc Trinh is a professor and current Rector at the University of Engineering and Technology, Vietnam National University, Hanoi. He holds degrees in physics and electrical engineering, and earned his Ph.D. from Delft University of Technology in 2007, focusing on microsystems and sensors. He has held various leadership roles since 2011 and authored over 200 publications. His research centers on MEMS, BioMEMS, microfluidics, and Organ-on-Chip technologies. He has received multiple awards, including the IEEE Sensors Best Paper Award (2016), and has served as editor and chair for international conferences.

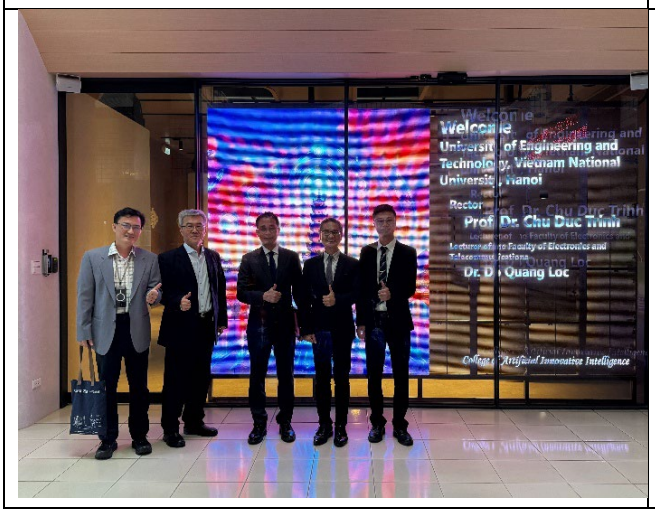
Topic ：Small Technologies, Big Impact: BioMEMS, Organ-on-Chip, and the Rise of Automated Biosystems

ABSTRACT

Recent advances in microscale engineering have transformed the landscape of biomedical technology. BioMEMS (Biological Microelectromechanical Systems) represent an advanced platform for the precise control and analysis of biological processes. As BioMEMS technology evolves, Organ-on-Chip technology has gained significant attention as a next-generation approach that mimics the structure and function of human organs on a microscale platform. By simulating key physiological functions in a controlled, miniaturized setting, Organ-on-Chip systems offer powerful tools for drug screening, disease modeling, and personalized medicine. In the context of female reproductive research, Organ-on-Chip systems have shown promise in creating a tailored biomimetic environment for oocyte and embryo culture, transforming the way they develop. The integration of automation and AI into Organ-on-Chip platforms further extends their capabilities by supporting dynamic culture conditions and enabling real-time, intelligent assessment of development progress. In this presentation, recent advances in BioMEMS and Organ-on-Chip technologies will be presented, with particular emphasis on their integration with automated biosystems in the context of female reproductive research.

MINUTES

Chu Duc Trinh, Rector of VNU University of Engineering and Technology, was invited as a distinguished speaker of the Panda Lecture. At 9:40 a.m. on November 10, accompanied by Department Chair Chien-Chi Wu and Professor Shung-Wen Kang of the Department of Mechanical and Electro-Mechanical Engineering, he was guided by Dean Tzung-Hang Lee—who concurrently serves as Dean of the College of Engineering, the College of Artificial Innovative Intelligence, and the College of Precision Healthcare—to visit the university's AI experiential facilities and explore the diverse cross-disciplinary applications of artificial intelligence. Through interactive demonstrations, President Chu experienced intelligent recognition, immersive simulations, and automated analysis systems. Dean Lee also explained how AI is integrated into academic research and classroom instruction to help students understand complex concepts, and shared the current development and future plans of the AI Innovation College. The visit prompted initial discussions on potential research collaborations and student exchange programs, making the interaction highly meaningful.(Photo 1&2)

Photo 1	Photo 2
	

At 10:30 a.m. and 11:00 a.m. on the same morning, Rector Chu Duc Trinh, accompanied by Dean Lee, Department Chair Chien-Chi Wu, and Professor Shung-Wen Kang, paid courtesy visits to President Huan-Chao Keh and Chairperson Chia-I Chang. Both university leaders extended a warm welcome, introduced the historical significance of the Panda Lecture Series, and presented him with the "Panda Lecture Trophy" as well as a commemorative vase featuring calligraphy by Masters Lee Chi-Mao and Chang Ping-Huang, along with Tamkang University scenery and its school anthem.(Photo 3-6)

Photo 3	Photo 4

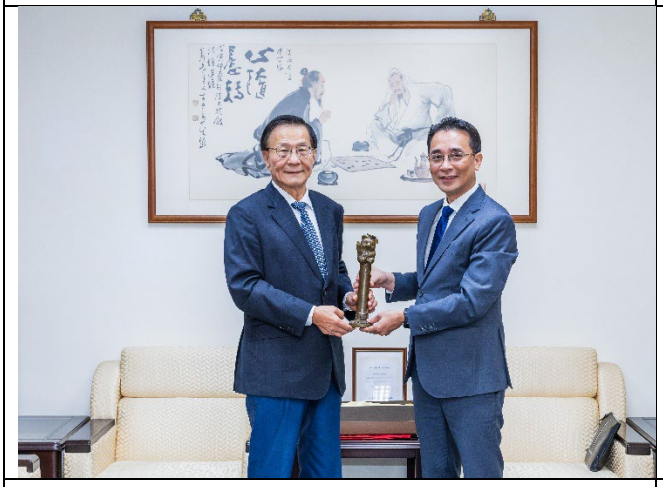



Photo 5	**Photo 6**
	

At 2:10 p.m. on November 10, President Chu delivered his lecture at the Hsu Shou-Chien International Conference Center, presenting his latest research breakthroughs in BioMEMS (Biological Microelectromechanical Systems) and organ-on-chip technologies to faculty and students. His 40-minute lecture was substantive and inspiring, drawing strong interest from the audience, followed by a lively 40-minute Q&A session with continuous questions.(Photo 7)

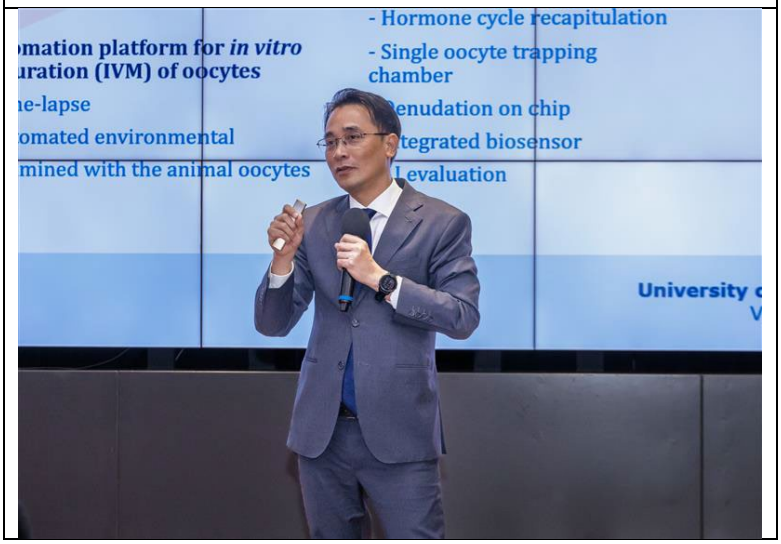
Photo 7


The lecture was hosted by the Department of Mechanical and Electro-Mechanical Engineering under the theme “Small Technologies, Big Impact: BioMEMS, Organ-on-Chip, and the Rise of Automated Biosystems.” The event opened with welcoming remarks by Dean Tzung-Hang Lee. (Photo 8)

Photo 8

Approaching the topic from the perspective of a physicist, Rector Chu Duc Trinh began with Newtonian mechanics and the modern physics of Nobel laureate Richard Feynman, guiding the audience from fundamental physics to the cutting-edge technologies of MEMS and BioMEMS. Citing Feynman’s well-known 1960s remark, “There is plenty of room at the bottom,” he introduced the opportunities unlocked by miniaturization and explained how electronic and non-electronic components can be integrated into microchips, paving the way for the emergence of BioMEMS. (Photo 9)

Photo 9



During the lecture, he also presented his laboratory’s advances in lab-on-a-chip research, particularly how microscale systems can accurately simulate human organ functions for drug

testing, disease modeling, and personalized medicine. He further introduced research achievements in lung cancer cells and female reproductive biology—such as oocyte and embryo culture—demonstrating the potential of microscale systems to create highly customized growth environments.

Faculty and students from Mechanical Engineering, Computer Science and Information Engineering, and Water Resources and Environmental Engineering actively participated in the discussion. Among them were Vice President for Academic Affairs Hui-Huang Hsu, professor Shung-Wen Kang, Department of Computer Science and Information Engineering Chair Shih-Hsing Chen, professor of Department of Water Resources and Environmental Engineering Chi-Wang Li, and Assistant professor of Department of Computer Science and Information Engineering Jo-Mei Feng. Graduate students also contributed enthusiastically, raising a total of 12 questions covering topics such as ethical considerations of organ-on-chip research, AI modeling challenges in BioMEMS, biosensor applications, the feasibility of applying BioMEMS directly to human organs, how early automated lung cancer detection systems can identify cancer cells, and experimental condition control. President Chu addressed each question thoroughly and expressed optimism about the future of technological development. (Photo 10&11)

Photo 10	Photo 11
	

President Chu remarked that it was a great honor to be invited as a Panda Lecture speaker and that he would display the trophy in his office as a memorable keepsake. During his first visit to Tamkang, he was impressed by the beauty of Tamsui. He also enjoyed a leisurely bicycle ride along the riverside and tasted local coffee. In his conversation with President Keh, he praised the university's facilities and faculty, and showed particular interest in the research strengths of the College of Engineering and the AI Innovation College, as well as the campus culture of professional certification. He revealed that he has already begun planning for master's students from his university to study at Tamkang and expressed hopes for further collaboration between the two

institutions. He also noted that Vietnam is currently promoting semiconductor development and expressed his wish to establish training pathways in Taiwan to help Vietnamese students build stronger professional foundations. (Photo 12)

Photo 12