



# A HEALTHIER FUTURE WITH MINIATURE ROBOTS

Microrobots enabling real-time vision and control are being tested **FOR MINIMALLY INVASIVE MEDICAL PROCEDURES.**

**A cross-disciplinary team at The Chinese University of Hong Kong (CUHK)** has presented a microrobotic system which amplifies the reach and visibility of a traditional endoscope. Their proposal allows for safe, precise and rapid passage across bio-barriers and tissues to push the frontiers of medical microrobots, according to Li Zhang, the project lead from CUHK Faculty of Engineering.

Inserting a surgical tube, no matter how small or flexible, into the narrow and complex gastrointestinal tracts is challenging, but robots at micro/nano scale are adept at navigating them. Zhang's lab has developed an endoscopy-assisted magnetic actuation with dual imaging system (EMADIS). It consists of an endoscopic unit to carry and track elastic and biocompatible microrobots, a programmed

magnetic field to deliver them rapidly and precisely, as well as an ultrasound imaging system to track them in body parts otherwise inaccessible and invisible.

**MICROBOTICS EPITOMIZES THE VALUE OF INNOVATIVE BIOMEDICINE, ONE OF THE STRATEGIC RESEARCH AREAS IN CUHK'S LATEST FIVE-YEAR STRATEGIC PLAN**

"Our design process is built on a good understanding of clinical requirements. Feedback from clinicians is essential for the development of biomedical engineering systems," says Zhang. In collaboration with Joseph Sung and Philip Chiu

from the Faculty of Medicine, Zhang is looking to enhance minirobot design based on stem cells harvested from a patient, which can minimize immune responses during their *in vivo* delivery.

Another research goal for Zhang's lab has been to create a swarming robotic system on the microscale, to specific blood clots, particularly to restore blood flow in the brain cavity for the ischemic stroke treatment. In 2018 and 2019, *Nature Communications* published Zhang's two research papers about microswarm, which directs millions of nanoparticles in a rapidly oscillating magnetic field in bio-fluids. Microswarm has since attracted international interest.

Microrobotics epitomizes the value of innovative biomedicine, one of the strategic research areas in CUHK's latest five-

year strategic plan. Their hope is that this emphasis on interdisciplinary research, with resources such as a dedicated off-campus medical robotics centre, provides opportunities for CUHK to become one of the world's leading innovative universities.

"Driven by this synergy of science, engineering and medicine, we look to welcome global talent and enable wider clinical applications for our translational research," says Zhang. ■



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