

CUHK Professor Named as a Top 10 Winner in Falling Walls Science Breakthroughs Award for Pioneering Advances in Nanoscale Fabrication

Prof. Shih-Chi Chen, Professor of the Department of Mechanical and Automation Engineering of the Chinese University of Hong Kong (CUHK), has been named as a top 10 winner for the prestigious Falling Walls Science Breakthroughs Award in the Engineering and Technology category. This is recognition of his revolutionary research in nanoscale 3D fabrication, which has shattered conventional barriers in the field.

Nanoscale 3D fabrication involves the creation of tiny structures that play vital roles in both advanced and everyday electronic, biomedical and photonic devices, among other uses. Prof. Chen's major breakthrough is a 3D nanofabrication platform that for the first time allows for multi-material fabrication of 20-nanometer precision at a light patterning rate of 400 mm³/hr, three orders of magnitude faster than conventional serial fabrication systems that are currently used in the commercial world, and at the significantly lower cost of US\$1.5/mm³. The unprecedented resolution, speed and cost-effectiveness, achieved at the same time, have made the technology possible for industry-scale application.

Leading his team from CUHK's Faculty of Engineering, Prof. Chen developed a femtosecond projection two-photon lithography platform that can pattern millions of depth-resolved voxels in tens of milliseconds in space to create arbitrarily complex 3D structures. By applying swellable hydrogel scaffolds on the projection platform, a multi-material 3D printing solution is realized, allowing for most water-dispersible materials, such as metals, alloys, semiconductors, polymers, ceramics and biomaterials, to be automatically assembled into functional structures and devices in a scalable fashion.

As such, the new method simultaneously advances all the key metrics in manufacturing: resolution, fabrication rate and cost. Not only can it make micro- and nanodevices not previously thought possible, but it can also make them at high throughput and low cost to support widespread practical applications in photonics, health, automobiles and even aerospace.

Prof. Chen said: 'Manufacturing is the foundation of engineering innovation. Our fabrication platform provides an effective and low-cost solution to scale up the fabrication of functional micro- and nano-structures. This means our technology could play a transformative role in fields such as healthcare, clean energy and water, computing, and telecommunications, resulting in the creation of new technologies and businesses.'

In a further contribution to 3D nanofabrication technology, Prof. Chen recently co-founded Astra Optics Ltd, a CUHK spin-off, which has been awarded for funding support by the 2023 Technology Start-up Support Scheme for Universities and the Incu-Tech Programme of the Hong Kong Science and Technology Park.

Another of Prof. Chen's CUHK start-ups, Precision Cut Ltd, was shortlisted as a finalist in the 'Science Start-ups' category of the Falling Walls Science Breakthroughs Award

for developing an ultrafast microtome to section fresh tissues and soft materials into thin slices; and the application of it to create a precise and effective drug screening platform for cancer patients, which is considered a major breakthrough in personalised medicine.

The Falling Walls Foundation, a charity supported by the German government and numerous acclaimed academic institutions, foundations, companies, and NGOs, has been hosting the Falling Walls Summit annually since 9 November 2009, the 20th anniversary of the peaceful fall of the Berlin Wall. It is a leading international, interdisciplinary and intersectoral forum for scientific breakthroughs and science dialogue. The Falling Walls Science Breakthroughs of the Year Award is a world-renowned international competition that honours the people who are pioneering solutions to the world's greatest challenges and creating breakthroughs across borders and disciplines. This year, it celebrates work in eight scientific, innovation, and humanistic categories.