

Serendipity Engineering

Keisuke Goda^{1, 2, 3}

¹Department of Chemistry, University of Tokyo, Japan

²Department of Bioengineering, University of California, Los Angeles, USA

³Institute of Technological Sciences, Wuhan University, China

Abstract— Many of the greatest scientific breakthroughs have been serendipitous. Alexander Fleming’s discovery of penicillin began with a mold-contaminated Petri dish. Percy Spencer’s invention of the microwave oven started when a chocolate bar melted in his pocket during radar testing. Penzias and Wilson uncovered key evidence for the Big Bang theory while trying to eliminate background noise from a radio antenna. These examples illustrate how unexpected observations, when met with a prepared and perceptive mind, can lead to transformative discoveries. In this talk, I will introduce the concept of serendipity engineering: a deliberate effort to foster such chance discoveries by building platform technologies that expand the space of observable phenomena and enable researchers to detect the unexpected.

Keisuke Goda is currently a professor in the Department of Chemistry at the University of Tokyo, as well as an adjunct professor in the Department of Bioengineering at UCLA and the Institute of Technological Sciences at Wuhan University. He earned a B.A. degree summa cum laude in Physics from UC Berkeley in 2001 and a Ph.D. in Physics from MIT in 2007. While at MIT, he contributed to the development of quantum-enhancement techniques in the LIGO group, which received the 2017 Nobel Prize in physics for the detection of gravitational waves. In 2007, he joined the Department of Electrical Engineering at UCLA as a postdoctoral researcher and program manager, where he focused on laser-based ultrafast optical imaging and spectroscopy, as well as microfluidic biotechnology. In 2012, Goda joined the Department of Chemistry at the University of Tokyo as a professor. His research group is currently dedicated to developing “serendipity-enabling technologies” through extreme engineering. He has authored nearly 300 journal papers, filed over 30 patents, and launched four startups: CYBO, Cupido, LucasLand, and FlyWorks. Goda has received more than 30 awards and honors, including the Japan Academy Medal, JSPS Prize, SPIE Biophotonics Technology Innovator Award, and Philipp Franz von Siebold Award.



REFERENCES

1. Nitta, N., T. Sugimura, et al., “Intelligent image-activated cell sorting,” *Cell*, 2018.
2. Ding, T., K. Lee, et al., “Image-activated cell sorting,” *Nature Reviews Bioengineering*, 2025.
3. Isozaki, A., H. Mikami, et al., “A practical guide to intelligent image-activated cell sorting,” *Nature Protocols*, 2019.
4. Nishikawa, M., H. Kanno, et al., “Massive image-based single-cell profiling reveals high levels of circulating platelet aggregates in patients with COVID-19,” *Nature Communications*, 2021.
5. Zhou, Y., A. Nakagawa, et al., “Emergent photonics for cardiovascular health,” *Nature Photonics*, 2025.
6. Hirose, K., S. Kodera, et al., “Direct evaluation of antiplatelet therapy in coronary artery disease by comprehensive image-based profiling of circulating platelets,” *Nature Communications*, 2025.
7. Nitta, N., et al., “Clinical-grade autonomous cytopathology via whole-slide edge tomography,” *medRxiv*, 2025.
8. Peterson, W., J. Arenson, et al., “Flow zoometry of *Drosophila*,” *bioRxiv*, 2025.