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Dr. Venkata Dandey

Hexa Robotics

Dr. Venkata P. Dandey, is co-founder of Hexa Robotics, which builds and commercially installs VitriFlex, a modular robotic platform for cryo-EM grid preparation. He is also Assistant Professor and Director of the Cryo-EM Center at the University of Connecticut and was previously Deputy Director of the Cryo-EM Center at NIEHS/NIH. At the New York Structural Biology Center's Simons Electron Microscopy Center he helped develop the Spotiton piezo-dispensing platform that became the commercial Chameleon instrument, and his time-resolved cryo-EM using Spotiton work demonstrated grid preparation capturing short-lived molecular states on ~100 ms timescales.



VitriFlex: An Open-Source Modular Robotic Platform for Sub-Second Vitrification, Reduced AWI Damage, and Time-Resolved Cryo-EM

Air-water interface adsorption in the moments between sample application and vitrification remains one of the biggest barriers to routine single-particle cryo-EM, causing partial denaturation, preferred orientation, and loss of fragile, dynamic macromolecules. VitriFlex is an open-source, modular, and low-cost robotic grid preparation platform that lets users explore vitrification conditions directly. This talk presents three modes implemented on VitriFlex — front-blotting (sample-blot-plunge), while-blot, and while-plunging — each freezing the grid within roughly 0.13 s of final sample deposition, and each giving independent control over deposition, film thinning, and dwell time. The latter two use a novel low-volume spray strategy in which sample is deposited onto an actively blotting buffer film. The same sub-second interval that limits interface exposure also opens the platform to time-resolved experiments, where the delay between mixing and vitrification becomes the experimental variable.

Benchmarked against conventional blotting and the commercial Chameleon system using human soluble ACE, all three VitriFlex modes systematically outrank Chameleon on particle integrity. Surprisingly, the best result came from the simplest mode: straightforward sample-blot-plunge preserved the highest fraction of intact four-domain dimer, with no partially denatured class at all, and gave the most uniform, highest-resolution reconstruction at 3.13 Å. It will also cover installation and support services through Hexa Robotics and introduce VitriClip.