



Scalable Nanomanufacturing of Metasurfaces & Plasmonic Opto-Mechanical Systems

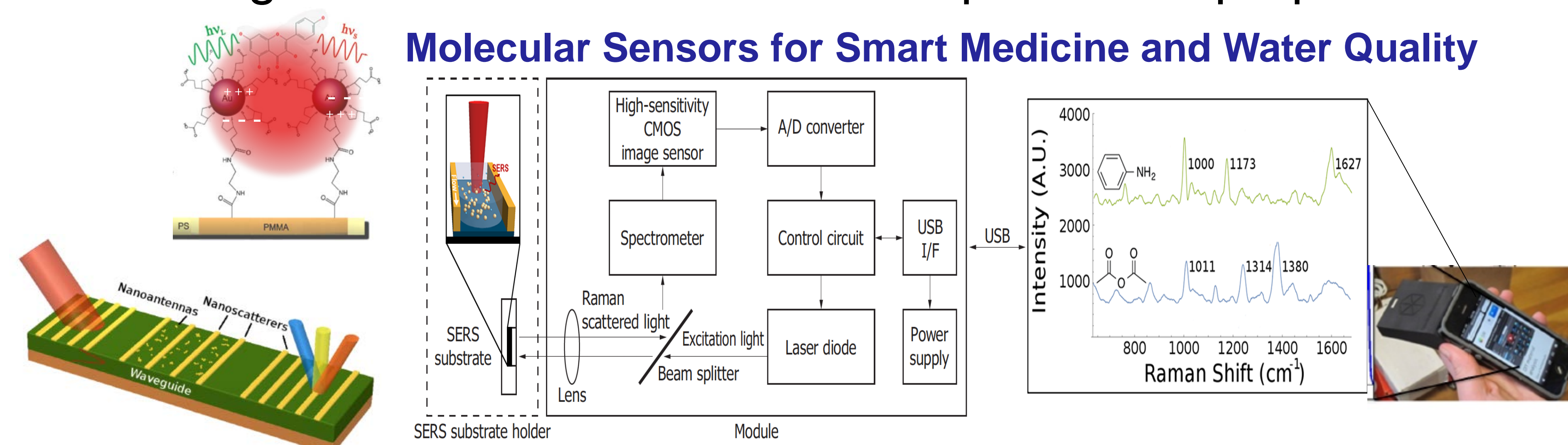
SNM: ENG-ECCS-1449397



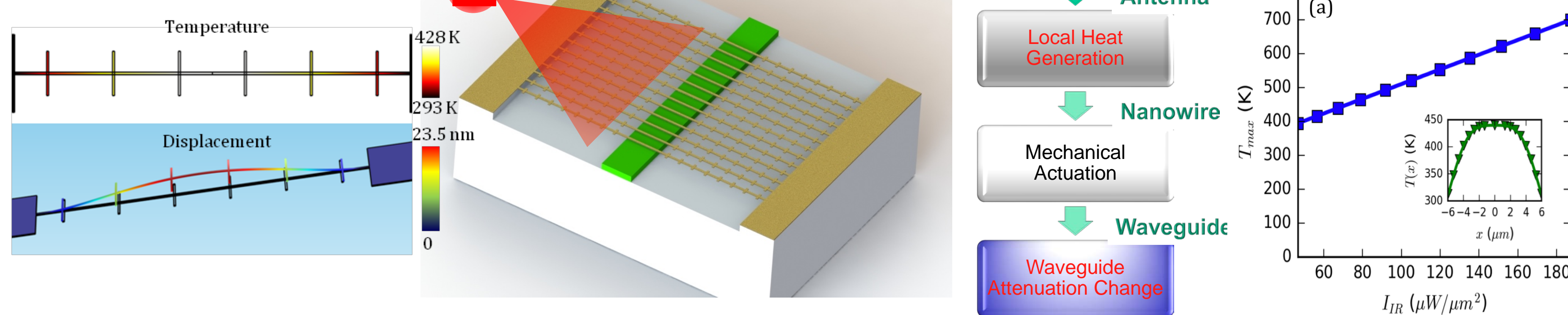
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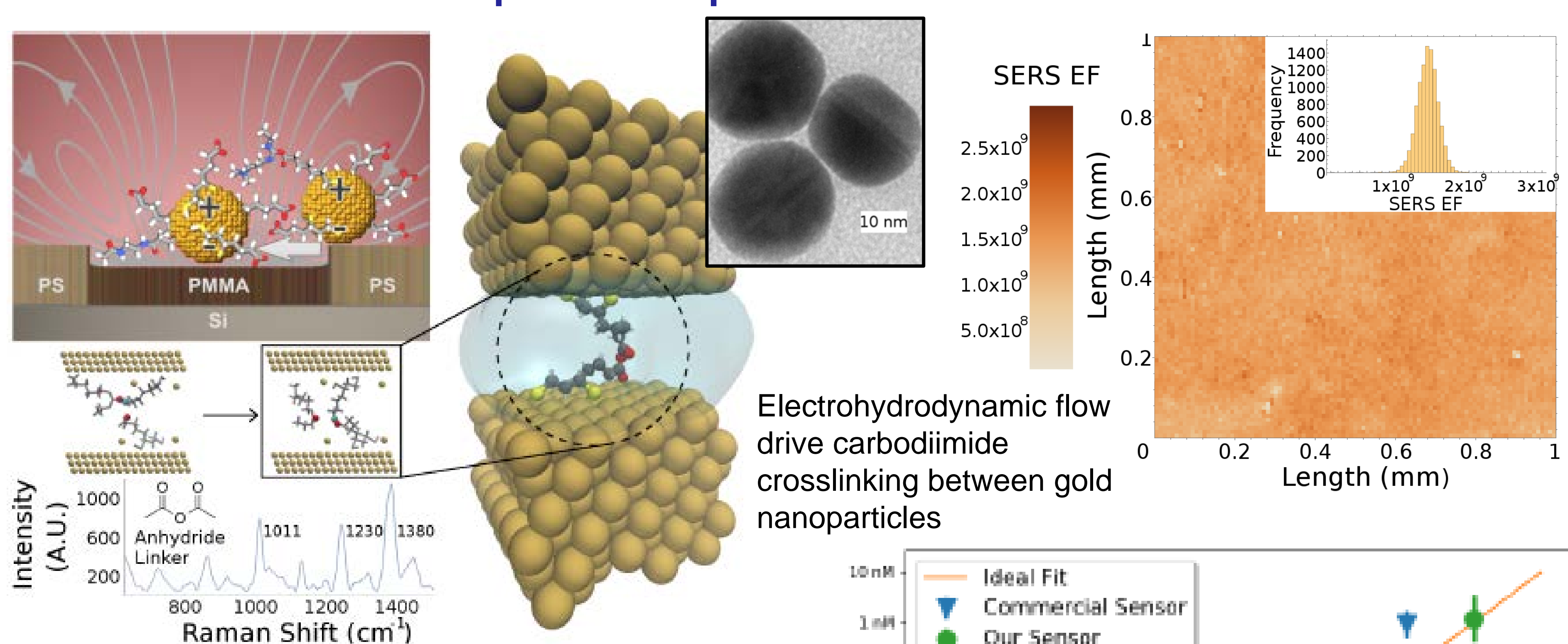
Routes for scalable nanomanufacturing of optical systems with control on molecular lengths scales allows for using near field electromagnetic interactions to offer unique device properties.



Opto-mechanical infrared sensors



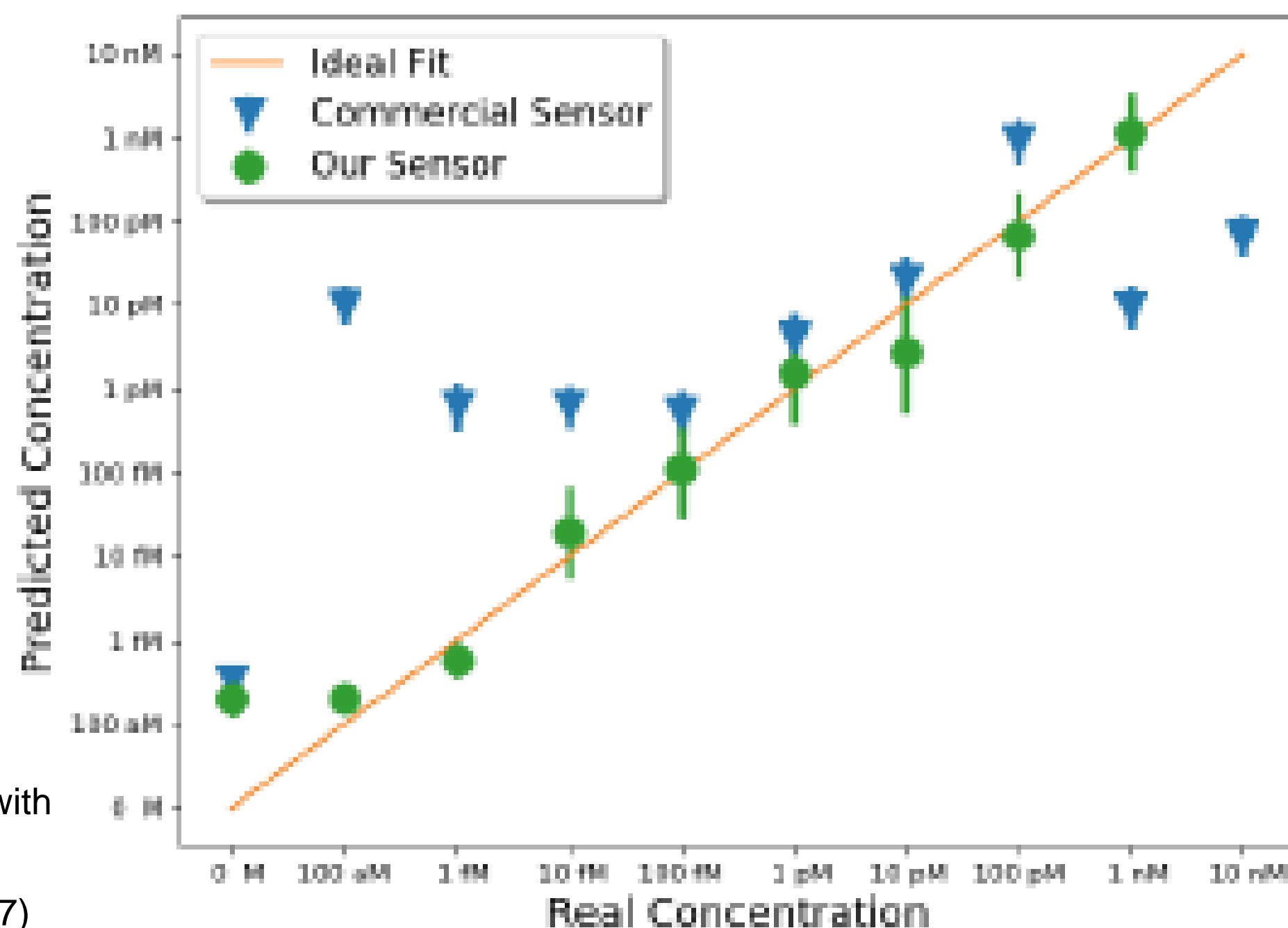
Chemical Assembly of Molecular Scale Plasmonic Nanogaps: Enable Single Molecule Sensors with reproducible performance



Uniform gap spacing provides detection of single molecules in nanogaps; provides billion-fold and reproducible signal enhancements in surface enhanced Raman scattering (SERS) sensors for collection of large data sets for analysis with artificial neural networks (ANN).

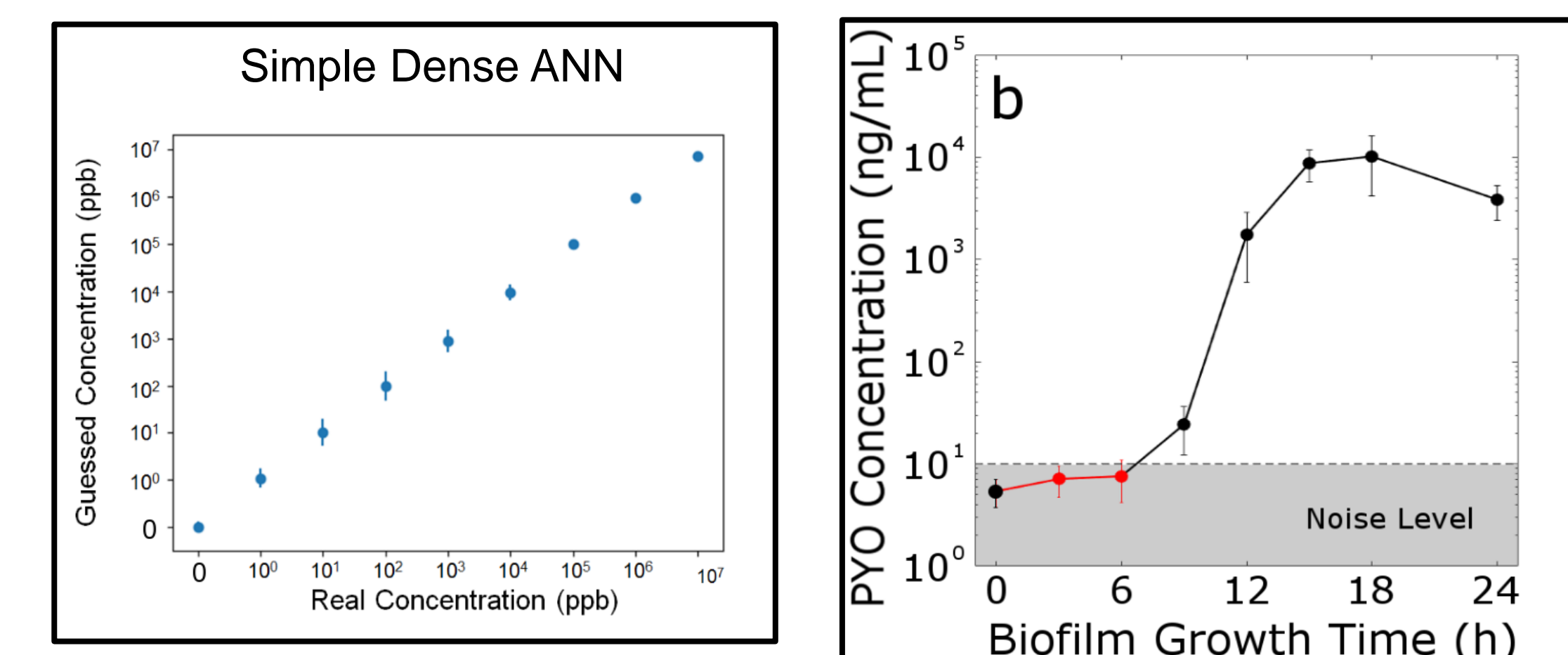
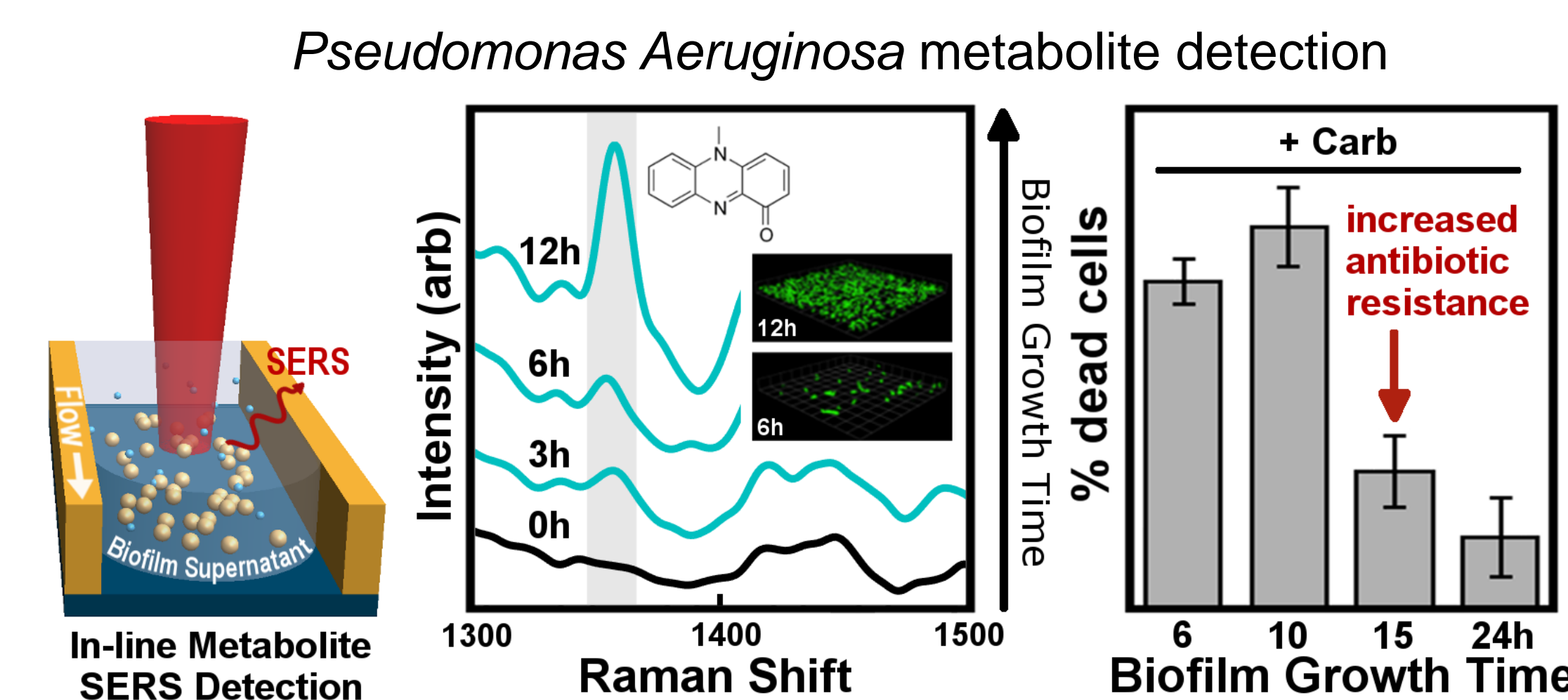
Thrift, William John, et al. "Driving Chemical Reactions in Plasmonic Nanogaps with Electrohydrodynamic Flow." *ACS nano* (2017)

Highlighted in *Nature Nanotechnology*: "Plasmonics: Chemistry in the gap." (2017)



New Smart Medicine approaches using SERS + Machine Learning

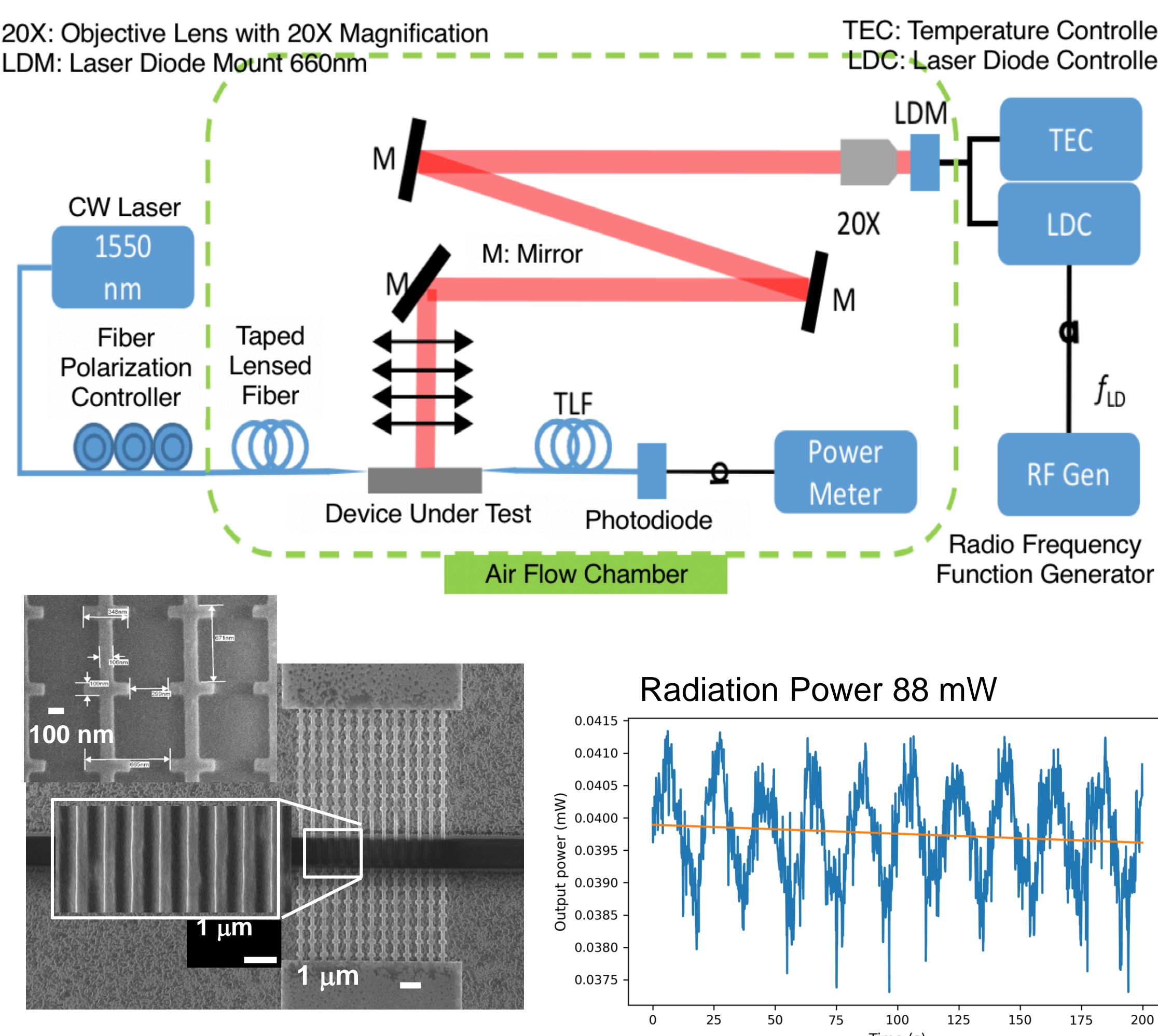
Early detection of bacterial biofilms



Pyocyanin is correlated with bacterial cell accumulation and can be detected as soon as 3 h before the biofilm exhibits increased antibiotic resistance.

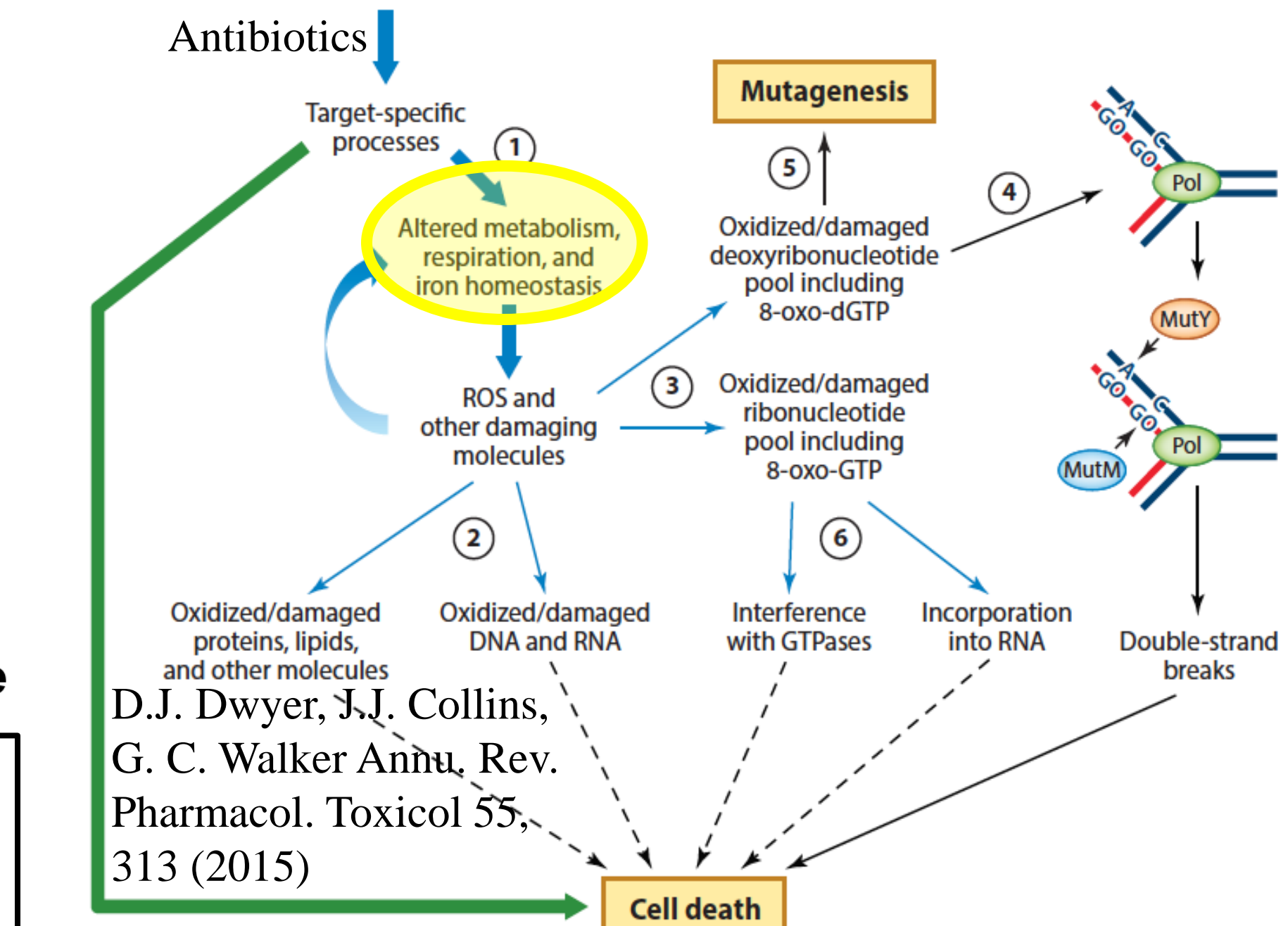
Nguyen, C. Q., Thrift, W. J., et al. "Longitudinal Monitoring of Biofilm Formation via Robust Surface-Enhanced Raman Scattering Quantification of *Pseudomonas aeruginosa*-Produced Metabolites." *ACS Appl. Mater. Interfaces* (2018)

Opto-mechanical infrared sensors operating at room temperature

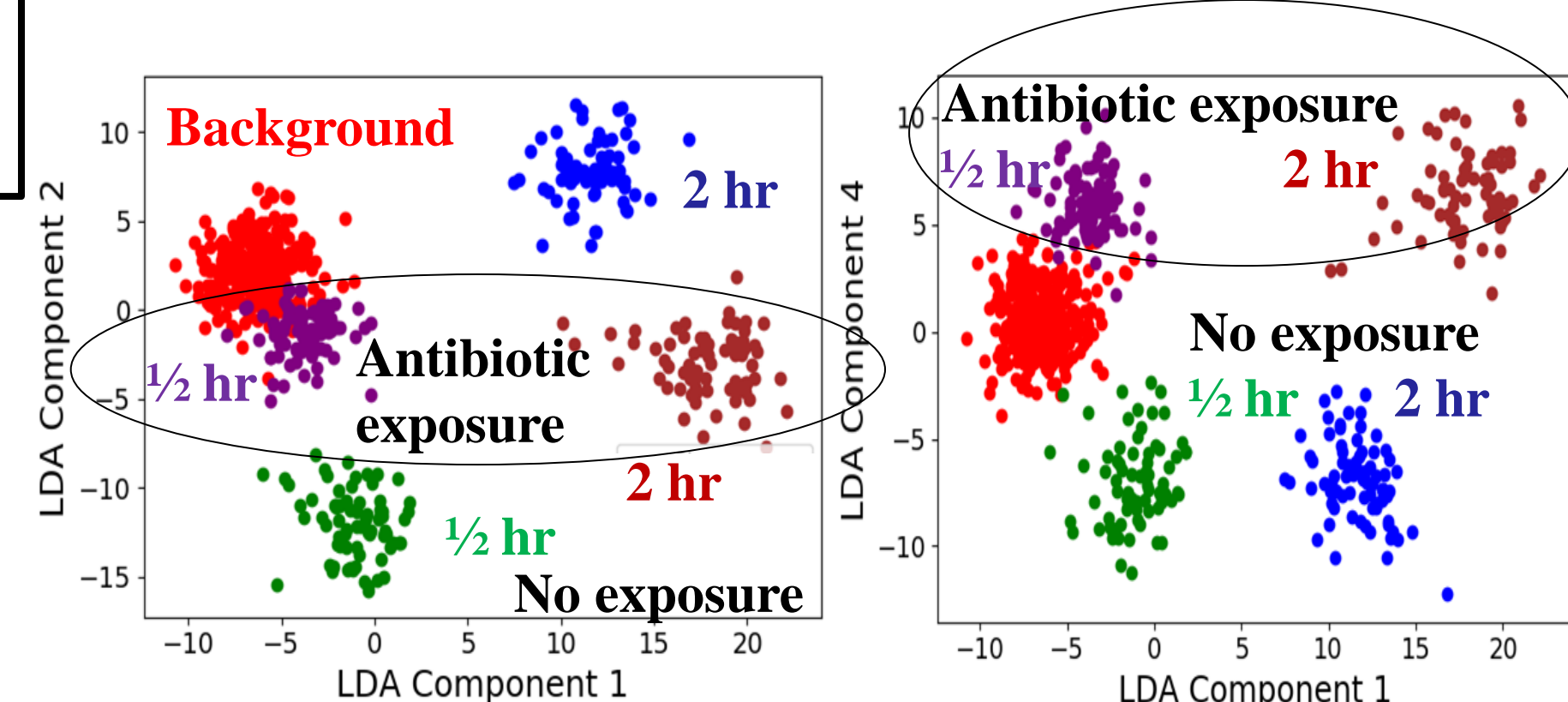


Experiments show the modulation in the probe waveguide signal caused by the free space radiation

Diagnostics for Antibiotic Stewardship



Linear discriminant analysis shows changes in metabolite profile in SERS spectra of *P. Aeruginosa* as early as 30 minutes after exposure to carbenicillin without culturing.



Outreach

Central City Value High School (CCVHS) students visited research laboratories and RapidTech, UCI's NSF-funded training center for developing and advancing additive manufacturing. They also received information on applying to UC Irvine and financial aid information. CCVHS serves students who have historically been underserved by the public school system, with the mission to establish and support high-quality charter schools for these populations. Several CCVHS have enrolled at UC Irvine as a result of the activities.



Acknowledgements

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