

Ji-Xin Cheng Group

Progress in 2020

Fellowships and Awards:

- Ji-Xin Cheng: Pittsburg Spectroscopy Award, March 2020
- Ji-Xin Cheng: Associate Editor of Science Advances (from Jan 2020)
- Peng Lin: SPIE Optics and Photonics Education Scholarship 2020
- Lu Lan: PhD Societal Impact Award, May 2020
- Yuewei Zhan: masters societal impact award, May 2020
- Delong Zhang, Lu Lan, Ji-Xin Cheng: Microscopy Today Innovation Award, Aug 2020

New Grants Received:

- NIGMS MIRA Award R35 GM136223 (2020 to 2025)
- R01 HL125385 05A1 (2020 to 2024)
- Daylight Solutions, Year 2 contract (2020 to 2021)
- NIH SBIR Phase 2, IR+Raman, EB027018 (2020 to 2022)

Career Advancement:

1. Dr Hyeon Jeong Lee, faculty at Zhejiang University, hjlee@zju.edu.cn
2. Dr Chi Zhang: Assistant Professor at Purdue University, zhan2017@purdue.edu
3. Dr Jie Hui: Postdoc at Wellman Center, starting March 2020; ustchui4@gmail.com
4. Dr. Kai-Chih Huang, scientist at Cygnal therapeutics. Company email khuang@cygnaltx.com.
5. Dr. Yingchun Cao, Dassault Systemes; ychcao1984@gmail.com
6. Mr. Kostas Mavrakis, finished his Fulbright fellowship, mavrakis@iesl.forth.gr
7. Ms. Tiffany Yang-Tran; admitted to MS program in TUFTS University, tyangtran@gmail.com
8. Dr. Pu-Ting Dong, postdoc at Harvard Dental School, pdong@forsyth.org
9. Dr. Yimin Huang, graduated in May 2020, joined Applied Materials, Yimin_Huang@amat.com
10. Dr. Jiayingzi Wu, graduated in May 2020, joined ShenZhen University, jyzwu@szu.edu.cn
11. Dr. Chen Li, graduated in May 2020, joined Cytochip Inc, cli@cytochipinc.com.
12. Dr. Xiaojie Li, graduated in Aug 2020. 厉晓洁 (Xiaojie LI) hitwhlxj@163.com
13. Dr. Minghua Zhuge, graduated in Aug 2020, Zhejiang University <cocky_string@163.com>
14. Dr. Caroline Karaja, graduated in Dec 2020, Purdue Chemistry, Postdoc at Cornell University
15. Dr. Ying Jiang, graduated in Dec 2020 from Boston University

List of publications in 2020 (total 23)

- 267. Cheng Zong, Chi Zhang, Peng Lin, Jiaze Yin, Yeran Bai, Haonan Lin, Bin Ren, and Ji-Xin Cheng, Real-time imaging of Surface Chemical Reactions by Electrochemical Photothermal Reflectance Microscopy, Chemical Science, 2020, accepted article.
- 266. Ryan M. Hekman et al., Actionable Cytopathogenic Host Responses of Human Alveolar Type 2 Cells to SARS-CoV-2, Molecular Cell, 2020, 80, 1-19
- 265. Linli Shi, Ying Jiang, Yi Zhang, Lu Lan, Yimin Huang, Ji-Xin Cheng, Chen Yang, A fiber optoacoustic emitter with controlled ultrasound frequency for cell membrane sonoporation at submillimeter spatial resolution, Photoacoustics, 2020, 20, 100208.
- 264. Jiabao Xu, Xiaojie Li, Zhongyue Guo, Wei E. Huang, Ji-Xin Cheng, Fingerprinting Bacterial Metabolic Response to Erythromycin by Raman-Integrated Mid-Infrared Photothermal Microscopy, Analytical Chemistry, 2020, 91, 14459-14465.
- 263. Lulu Jiang, Jian Zhao, Ji-Xin Cheng, Benjamin Wolozin, Tau Oligomers and Fibrils Exhibit Differential Patterns of Seeding and Association with RNA Binding Proteins, Frontiers in Neurology, 2020, 11, article 579434.
- 262. [Xueli Chen](#), [Shouping Zhu](#), [Huiyuan Wang](#), [Cuiping Bao](#), [Defu Yang](#), [Chi Zhang](#), [Peng Lin](#), [Ji-Xin Cheng](#), [Yonghua Zhan](#), [Jimin Liang](#), [Jie Tian](#), Accelerated Stimulated Raman Projection Tomography by Sparse Reconstruction From Sparse-View Data, IEEE Trans Biomed Eng, 2020, 67(5):1293-1302.
- 261. Jing Zhang, Haonan Lin, Jian Zhao, Yuying Tan, Ji-Xin Cheng*, High-Speed Chemical Imaging by Dense-Net Learning of Femtosecond Stimulated Raman Scattering, JPC Letters, 2020, 11, 8573-78.
- 260. Jiayingzi Wu, Yifan Zhu, Liyan You, Pu-Ting Dong, Jianguo Mei,* and Ji-Xin Cheng*, Polymer Electrochromism Driven by Metabolic Activity Facilitates Rapid and Facile Bacterial Detection and Susceptibility Evaluation, Advanced Functional Materials, 2020, 2005192.
- 259. Peng Lin, Hongli Ni, Huate Li, Nicholas A. Vickers, Yuying Tan, Ruyi Gong, Thomas Bifano, Ji-Xin Cheng, Volumetric chemical imaging in vivo through a remote-focusing SRS microscope, Optics Express, 2020, 28: 30210

Publications in 2020, continued

- 258. Zong, C., Cheng, J.X., Origin of dispersive line shapes in plasmon-enhanced stimulated Raman scattering microscopy, Nanophotonics (published online ahead of print), 2020, 20200313.
- 257. Zhang, M., Hong, W., Abutaleb, N. S., Li, J., Dong, P.-T., Zong, C., Wang, P., Seleem, M. N., Cheng, J.-X., Rapid Determination of Antimicrobial Susceptibility by Stimulated Raman Scattering Imaging of D₂O Metabolic Incorporation in a Single Bacterium. Advanced Science. 2020, 2001452
- 256. Lars Rishøj, Fengyuan Deng, Boyin Tai, Ji-Xin Cheng, and Siddharth Ramachandran, “Jitter-free, dual-wavelength, ultrashort-pulse, energetic fiber sources using soliton self-mode conversion,” Opt. Express 28, 4333-4339 (2020).
- 255. Leanse, L. G., Goh, X. S., Cheng, J.-X., Hooper, D. C. & Dai, T. “Dual-wavelength photo-killing of methicillin-resistant *Staphylococcus aureus*”. JCI Insight 2020, 5(11):e134343
- 254. Lu Lan, Yueming Li, Tiffany Yang-Tran, Ying Jiang, Yingchun Cao, Ji-Xin Cheng, “Ultraefficient thermoacoustic conversion through a split ring resonator,” Advanced Photonics 2(3) 036006 (2020) [[SPIE news](#)]
- 253. Cao, Y, Alloosh, M, Sturek, M, Cheng, J-X. Highly sensitive lipid detection and localization in atherosclerotic plaque with a dual-frequency intravascular photoacoustic/ultrasound catheter. Translational Biophotonics, 2020, e202000004.
- 252. Xueli Chen*, Xinyu Wang, Lin Wang, Peng Lin, Chi Zhang, Ji-Xin Cheng, “Stimulated Raman scattering signal generation in scattering medium using self-reconstructing Bessel beams”, Photonics Research, 2020, 8:929.
- 251. Jiayingzi Wu, Hyeon Jeong Lee, Liyan You, Xuyi Luo, Tsukasa Hasegawa, Kai-Chih Huang, Peng Lin, Timothy Ratliff, Minoru Ashizawa, Jianguo Mei*, Ji-Xin Cheng*, Functionalized NIR-II semiconducting polymer nanoparticle for single-cell to whole-organ imaging of PSMA-positive prostate tumor, Small, 2020, DOI: 10.1002/smll.202001215.

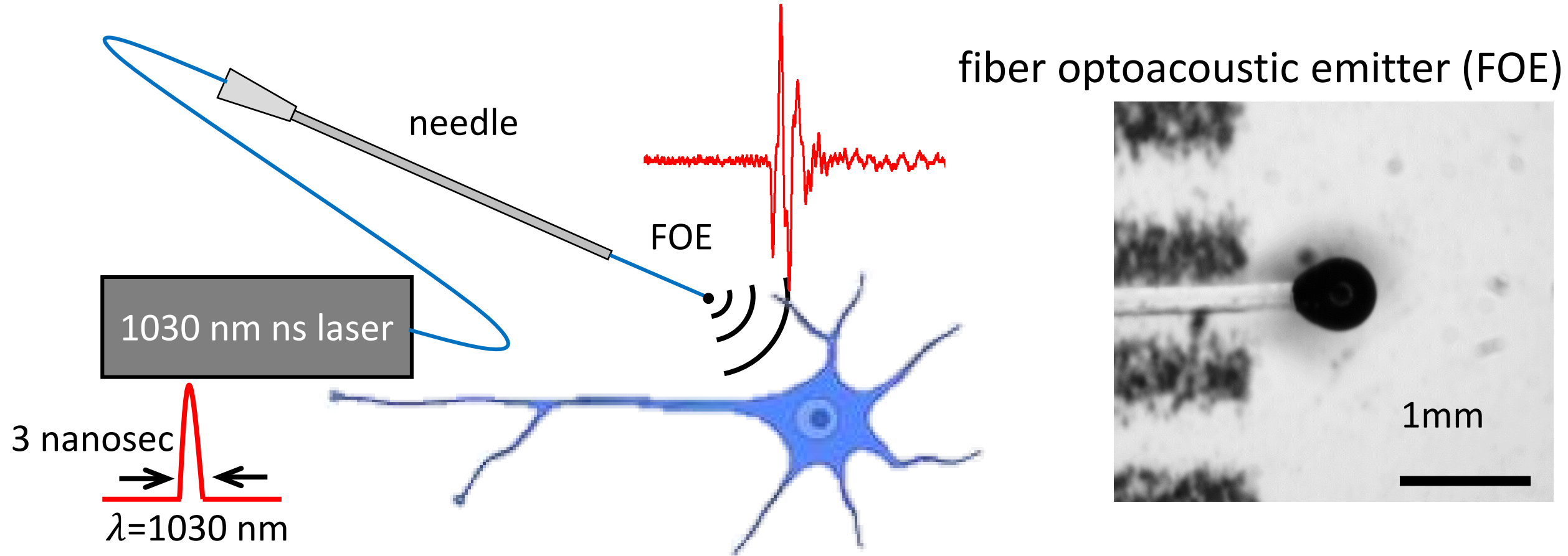
Publications in 2020, continued

- 250. Haozheng Li, Yong Cheng, Huajun Tang, Yali Bi, Yage Chen, Guang Yang, Shoujing Guo, Sidan Tian, Jiangshan Liao, Xiaohua Lv, Shaoqun Zeng, Mingqiang Zhu, Chenjie Xu, Ji-Xin Cheng, Ping Wang*, Imaging chemical kinetics of radical polymerization with an ultrafast coherent Raman microscope, Advanced Science, 2020, 7: 1903644
- 249. Sebastian Jusuf, Jie Hui, Pu-Ting Dong, Ji-Xin Cheng, Synergistic Eradication of Methicillin-resistant *Staphylococcus aureus* by Staphyloxanthin Photolysis and Low Concentration Silver Nanoparticles, Journal of Physical Chemistry C, 2020, 9: 5321-5330.
- 248. Kai-Chih Huang, Junjie Li, Chi Zhang, Yuying Tan, Ji-Xin Cheng, “Multiplex stimulated Raman scattering imaging cytometry reveals cancer metabolic signatures in a spatially, temporally, and spectrally resolved manner”, (Cell Press) iScience, 2020, 23: 100953. <https://doi.org/10.1016/j.isci.2020.100953>
- 247. Jie Hui, Pu-Ting Dong, Lijia Liang, Taraknath Mandal, Junjie Li, Erilinda R. Ulloa, Yuewei Zhan, Sebastian Jusuf, Cheng Zong, Mohamed N. Seleem, George Y. Liu, Qiang Cui, Ji-Xin Cheng, “Photo-Disassembly of Membrane Microdomains Revives Conventional Antibiotics against MRSA”, Advanced Science, 2020, 7: 1903117.
- 246. Yifan Zhu, Ji-Xin Cheng*, “Transient absorption microscopy: Technological Innovations and Applications in Materials Science and Life Science”, J Chem. Phys., Perspective, 2020, 152: 020901.
- 245. Ying Jiang, Hyeon Jeong Lee, Lu Lan, Hua-an Tseng, Chen Yang, Heng-Ye Man, Xue Han and Ji-Xin Cheng*. “Optoacoustic brain stimulation at sub-millimeter spatial precision”, Nature Communications, 2020, 11:881.

In press 2021

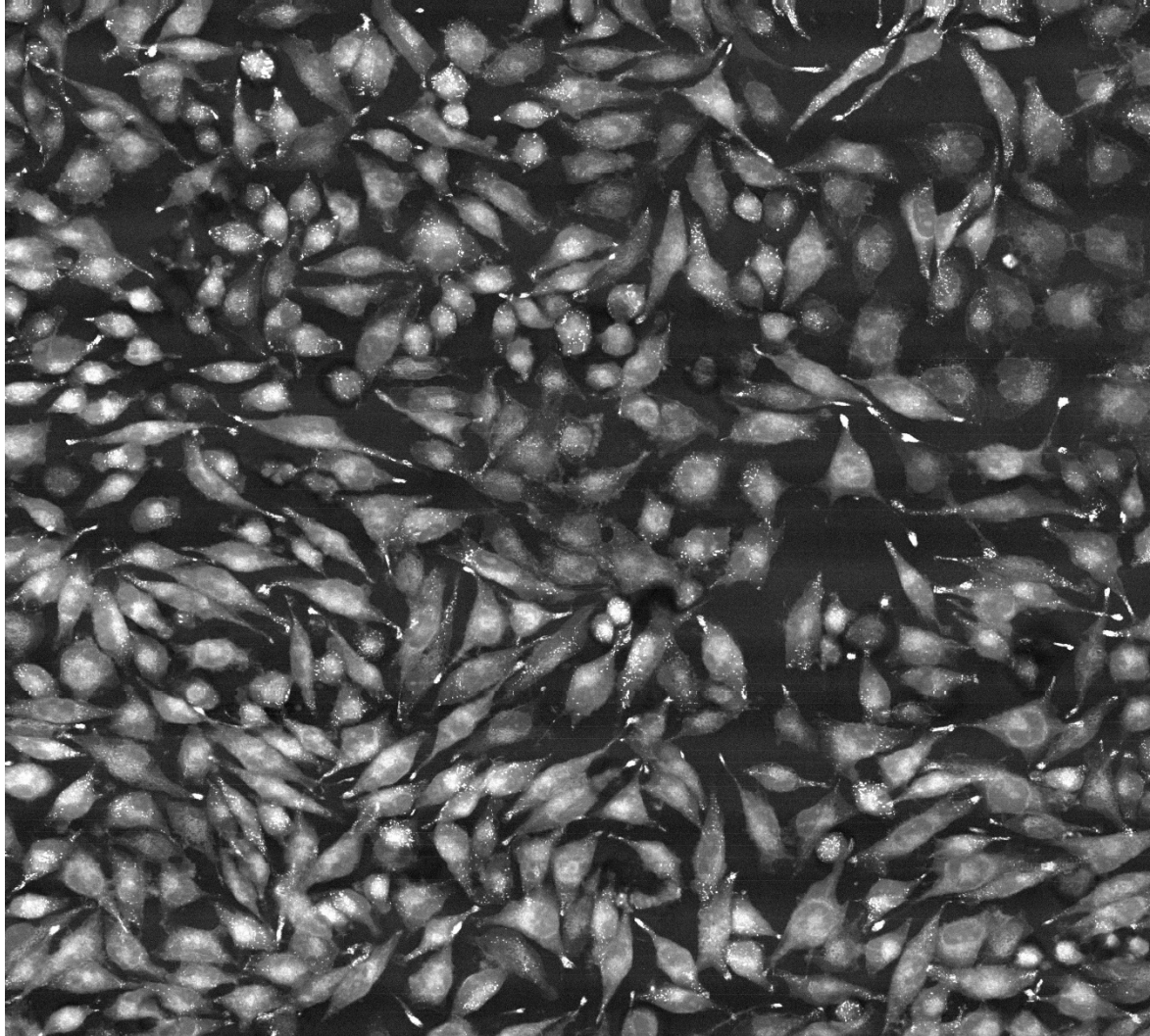
271. Yinu Wang, Guangyuan Zhao, Salvatore Condello, Hao Huang, Horacio Cardenas, Edward Tanner, Jian-Jun Wei, Yanrong Ji, Junji Li, Ji-Xin Cheng, Daniela Matei, “Frizzled-7 Identifies Platinum Tolerant Ovarian Cancer Cells Susceptible to Ferroptosis”, Cancer Research, 2020 doi: 10.1158/0008-5472.CAN-20-1488
270. Zhaoyi Li, Peng Lin, Yao-Wei Huang, Joon-Suh Park, Wei-Ting Chen, Zhujun Shi, Cheng-Wei Qiu, Ji-Xin Cheng, Federico Capasso*, “Meta-optics for a virtual reality and augmented reality system”, Science Advances, 2021, accepted
269. Pu-Ting Dong, Cheng Zong, Zeina Dagher, Jie Hui, Junjie Li, Yuewei Zhan, Meng Zhang, Michael K. Mansour, Ji-Xin Cheng*, Polarization-sensitive stimulated Raman scattering imaging resolves amphotericin B orientation in *Candida* membrane, Science Advances, 2021 Jan 6
268. Ying Jiang, Yimin Huang, Xuyi Luo, Jiayingzi Wu, Haonan Zong, Linli Shi, Ran Cheng, Yifan Zhu, Shan Jiang, Xiaoting Jia, Jianguo Mei, Heng-Ye Man, Ji-Xin Cheng, Chen Yang*, High Precision Neural Stimulation in vitro and in vivo by Photoacoustic Nanotransducers, (Cell Press) Matter, 2021, online
267. Cheng Zong, Chi Zhang, Peng Lin, Jiaze Yin, Yeran Bai, Haonan Lin, Bin Ren, and Ji-Xin Cheng*, Real-time imaging of Surface Chemical Reactions by Electrochemical Photothermal Reflectance Microscopy, Chemical Science, 2021, online.

Genetics-free Optoacoustic Neurostimulation at Ultra-High Spatial Precision



Ying Jiang et al, Nature Communications, 11:881, 2/14/2020

A metabolic signature in response to stress : Lipid-rich protrusions



R33CA23581, (Cell Press) iScience, 2020

Heterogeneity of Intracellular Lipid & Local Energy Production

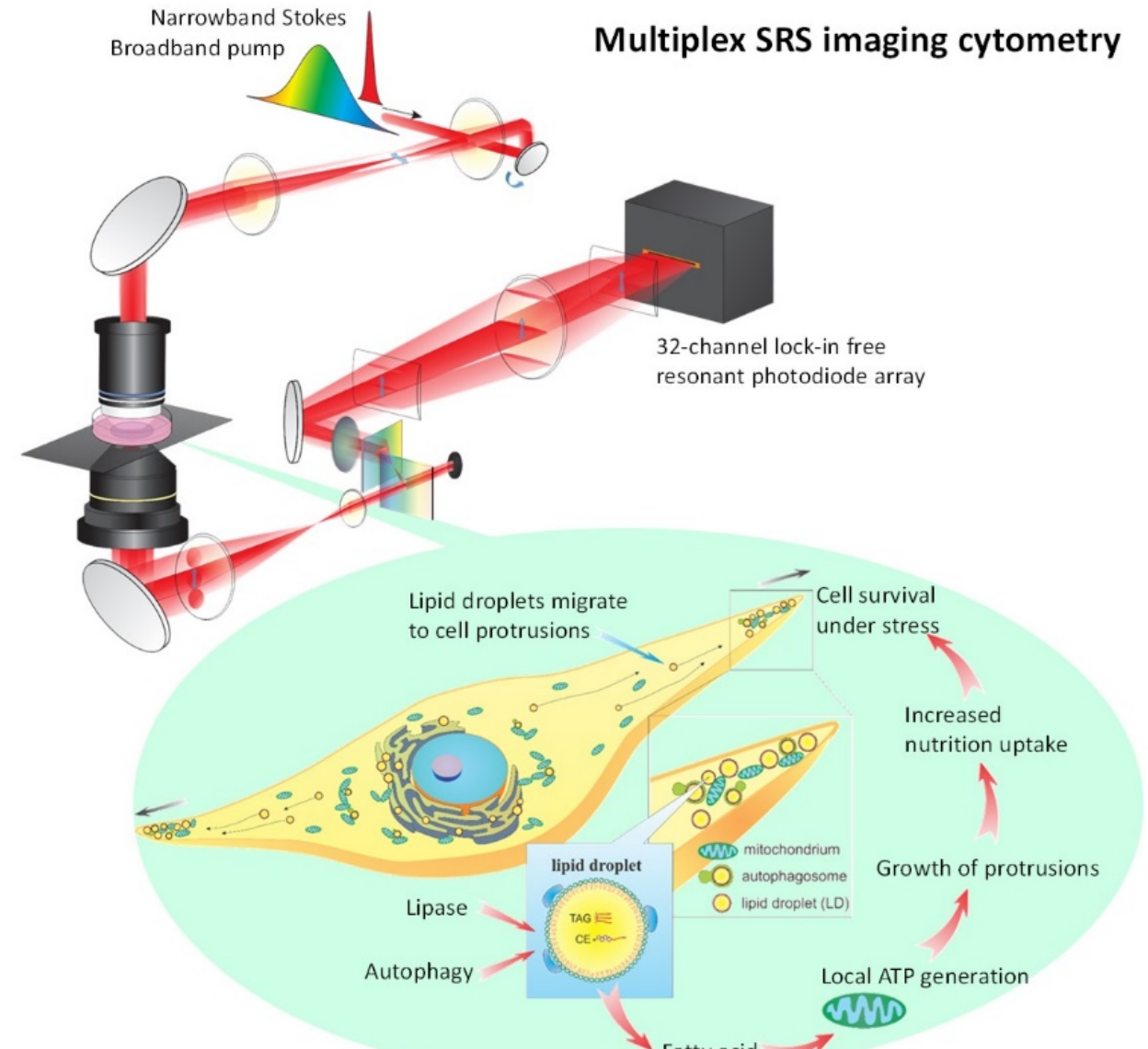




Photo-Disassembly of Membrane Microdomains Revives Conventional Antibiotics against MRSA

Jie Hui, Pu-Ting Dong, Lijia Liang, ...,
Cheng, Advanced Science, 2020,
7:1903117 (reported by BU/Brink)

Photons can Treat MRSA Infection on Human

Before light treatment

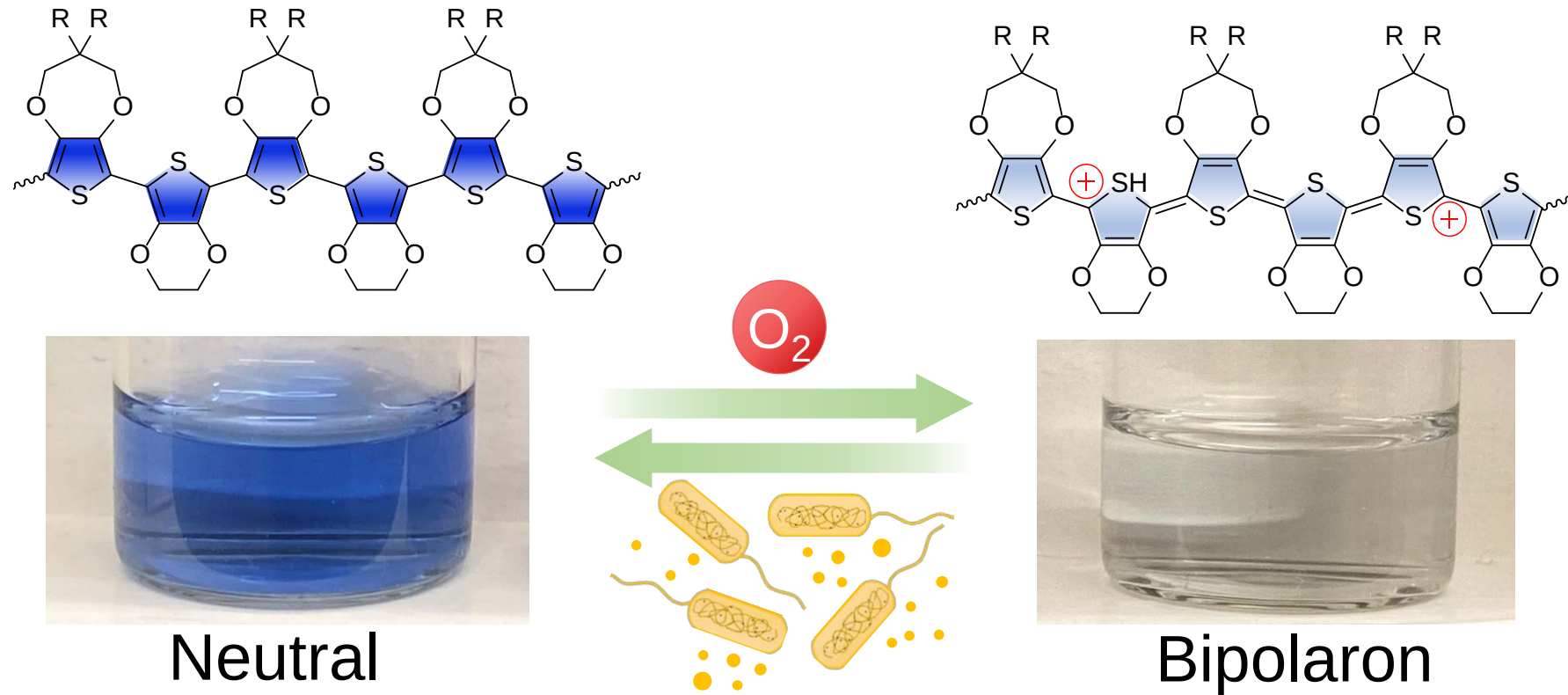


**After light treatment
3 days**

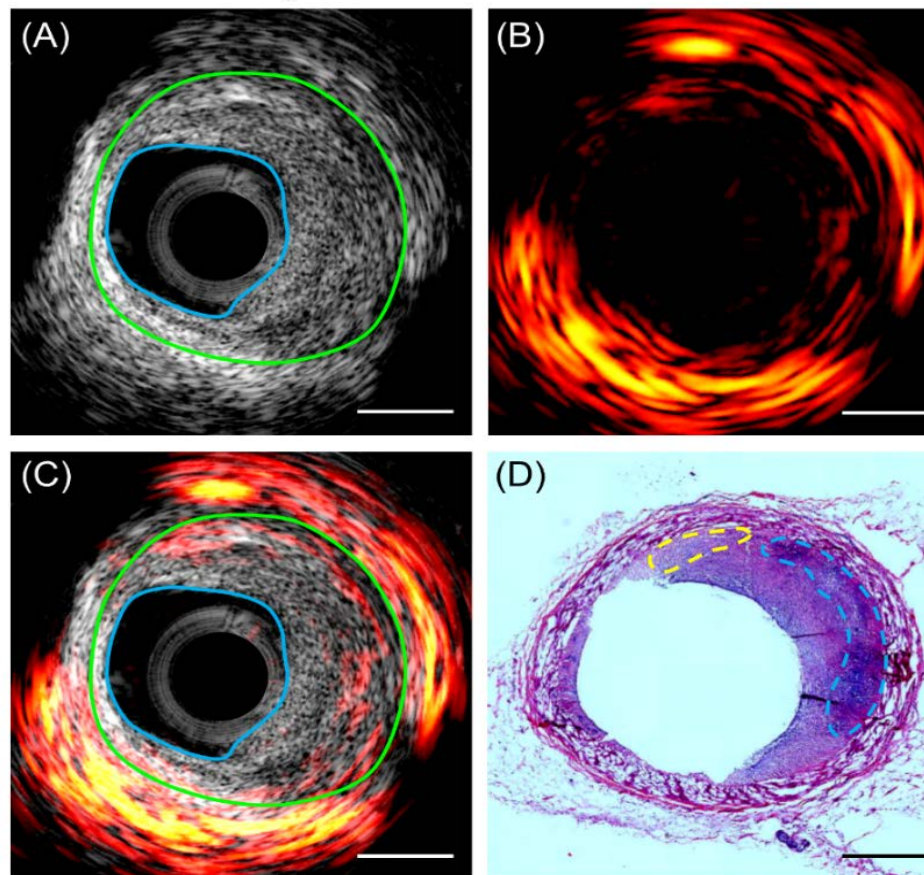
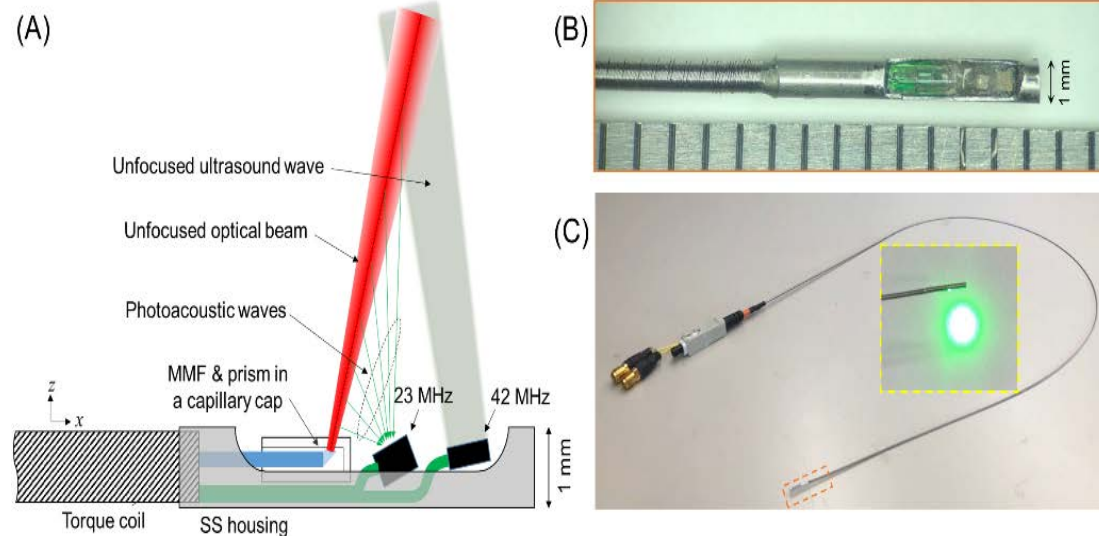
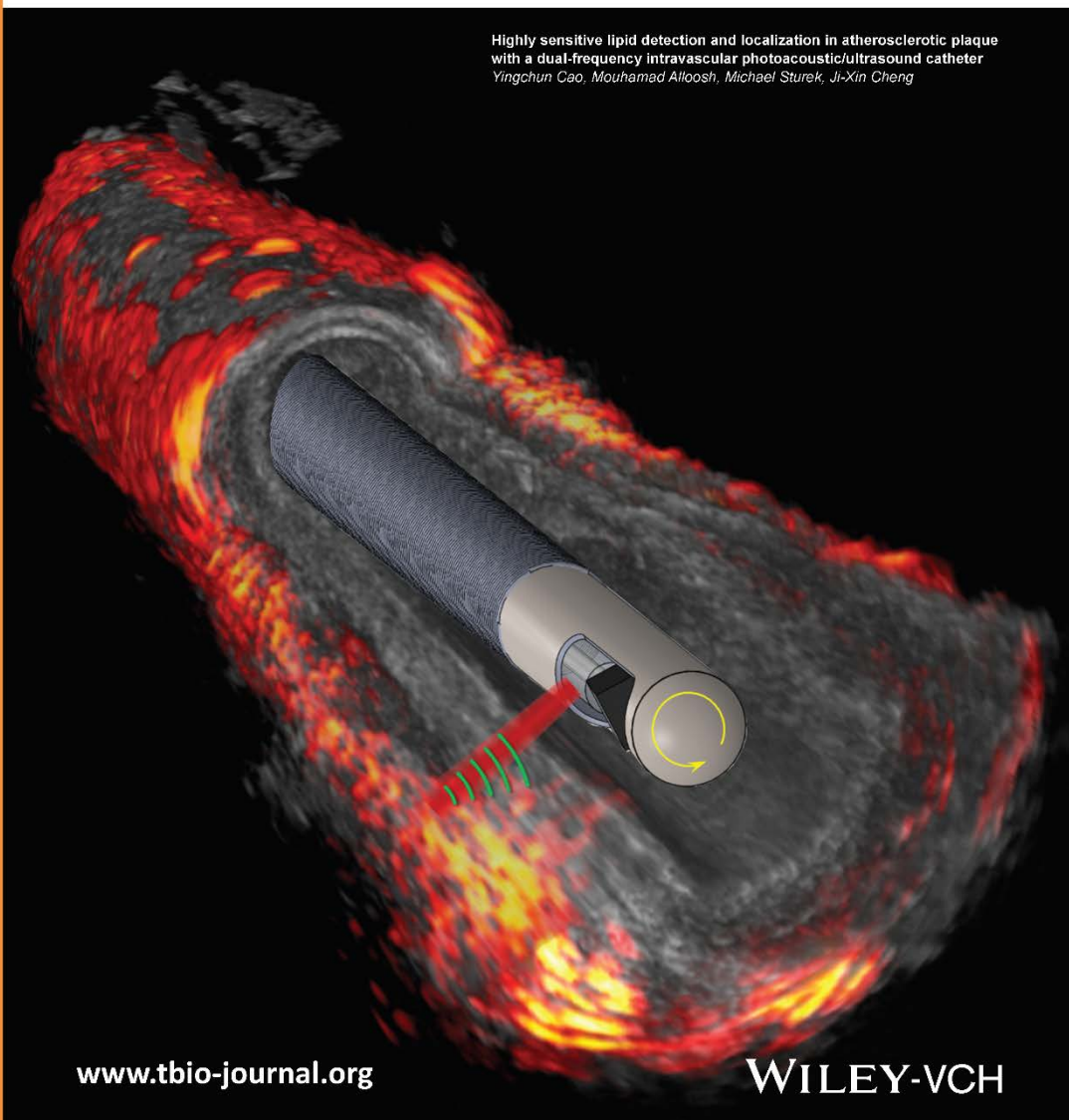


“Polymer electrochromism driven by metabolic activity facilitates rapid and facile bacterial detection and susceptibility test”

Jiayingzi Wu, Yifan Zhu et al, Advanced Functional Materials, 2020



Highly sensitive lipid detection and localization in atherosclerotic plaque with a dual-frequency intravascular photoacoustic/ultrasound catheter
Yingchun Cao, Mouhamad Alloosh, Michael Sturek, Ji-Xin Cheng



Dual Transducer IVPA

Imaging

Yingchun Cao,
Alloosh,
Sturek,
Cheng
August 2020

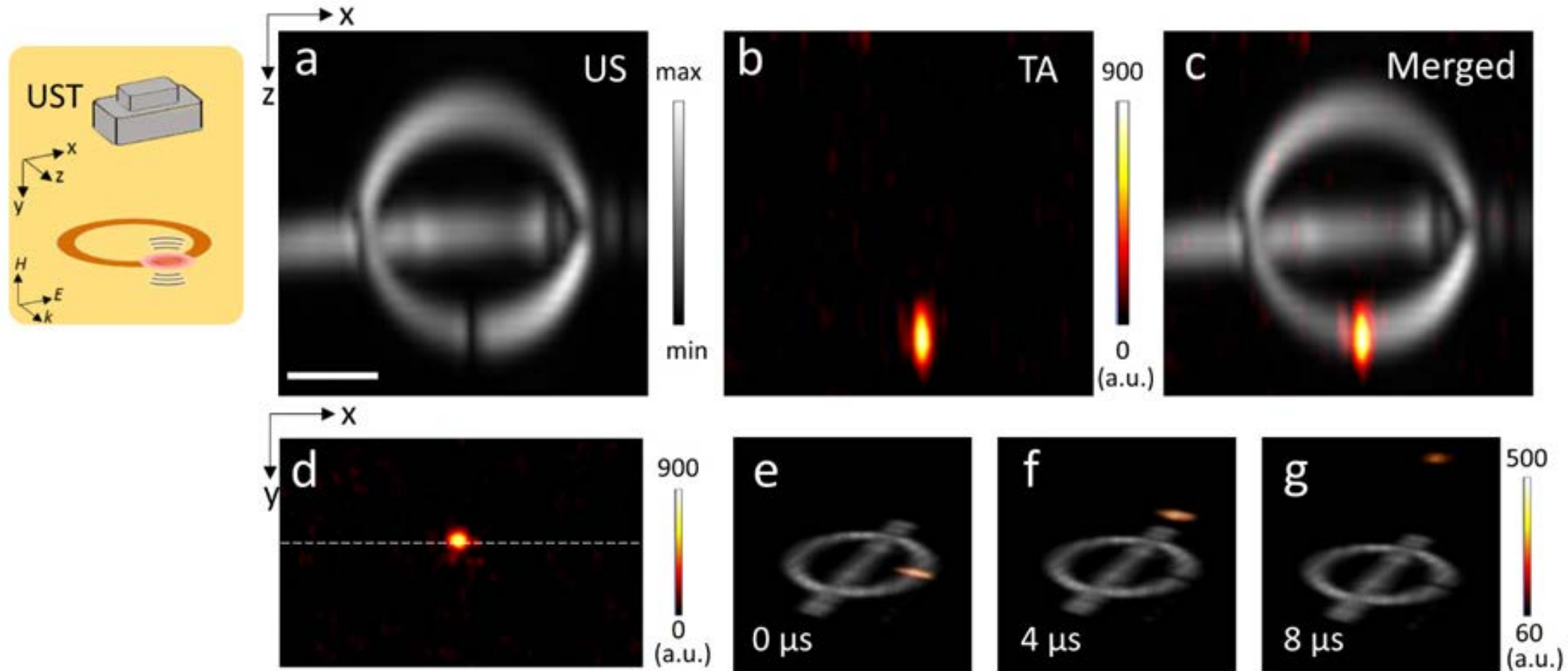
Hot Ring Produces Microwave-Powered Ultrasound Pulses Wirelessly

Innovative wireless split-ring resonator concentrates microwaves into a hot-spot for ultrasound emission

18 June 2020

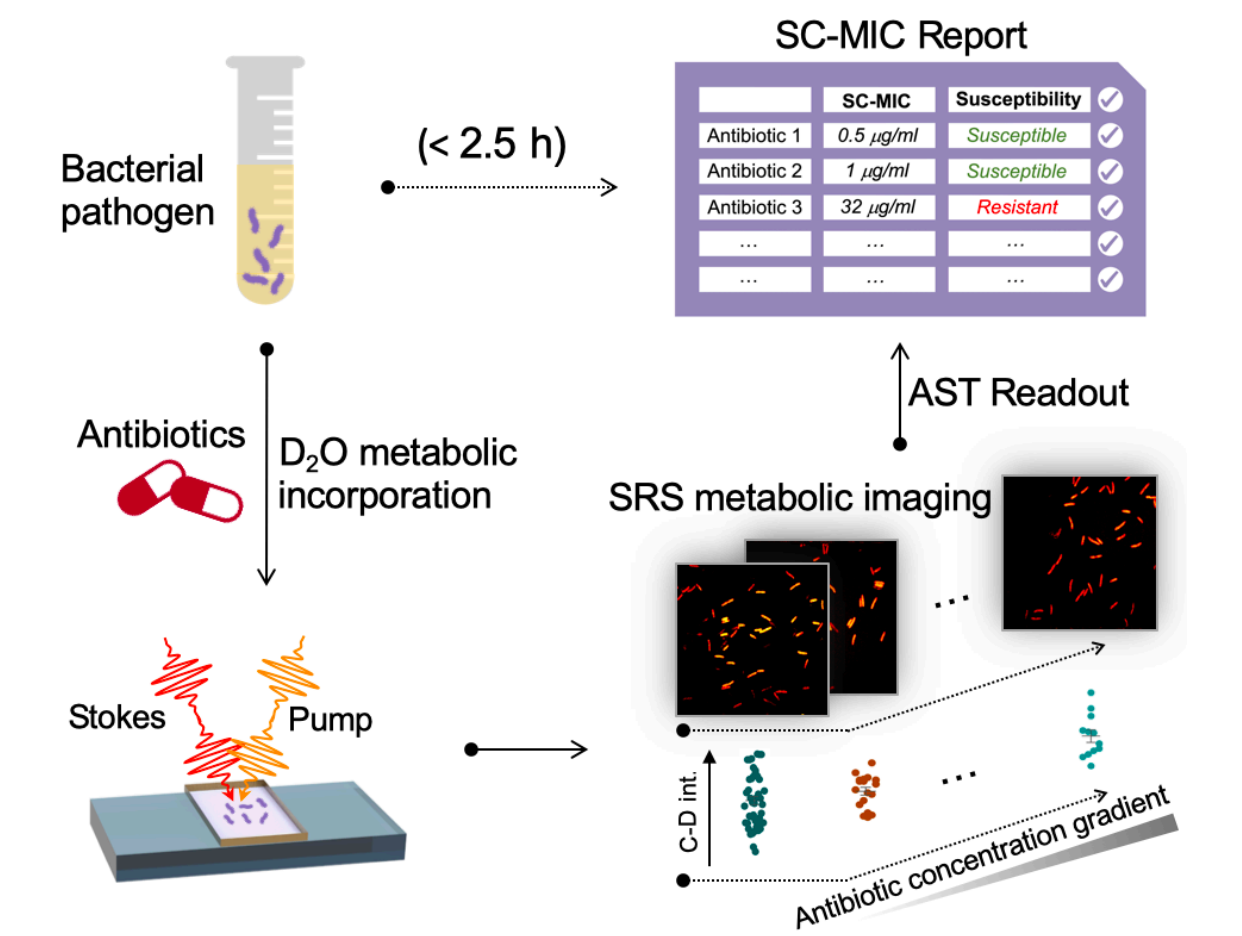
Thermoacoustic imaging of ultrasound wave generation from the split ring resonator, from Lan et al. 2020, Figure 3 (doi 10.1117/1.AP.2.3.036006)

Lu Lan,
Yueming Li,
Tiffany Yang-
Tran
(undergraduate)

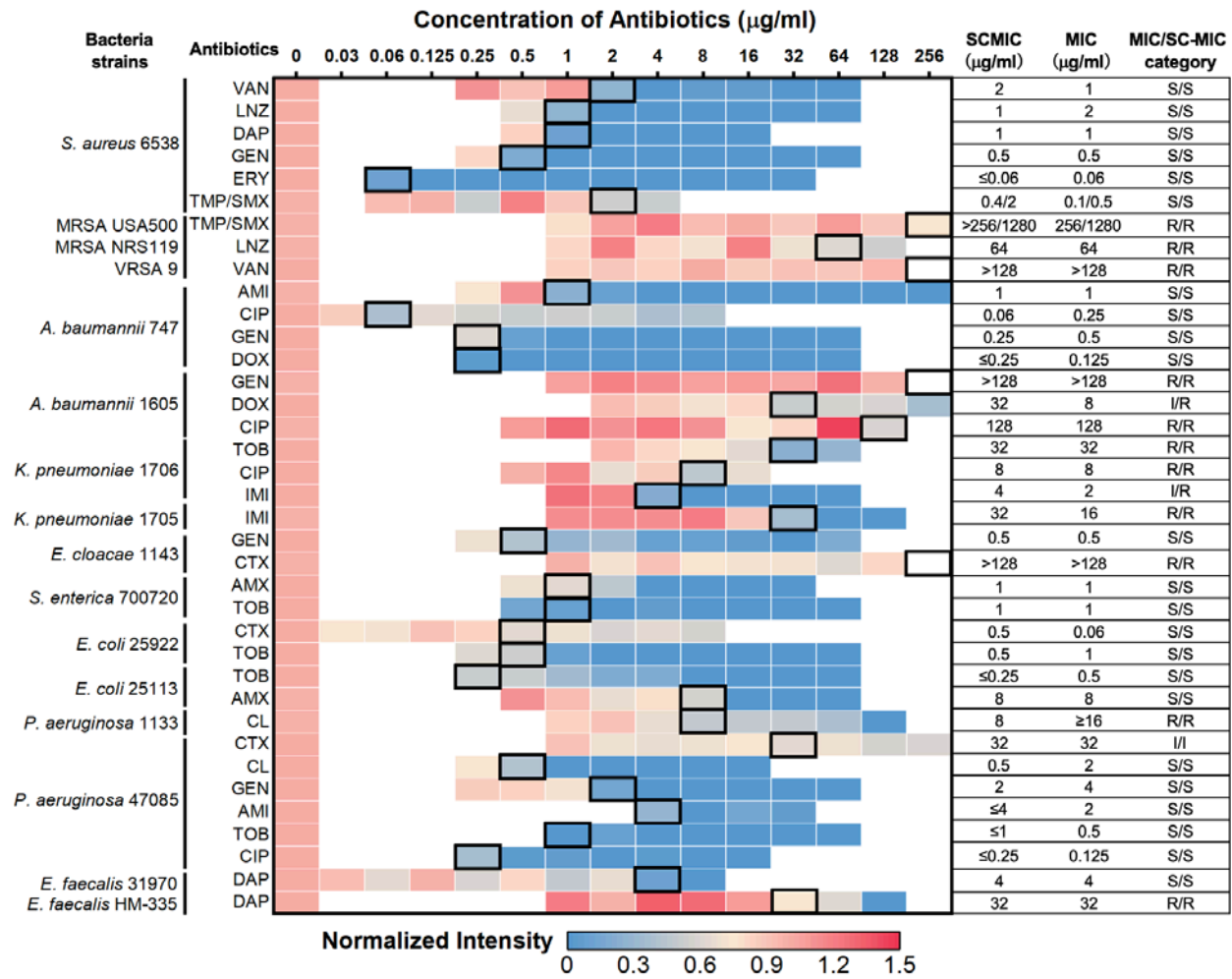


Rapid Determination of Antimicrobial Susceptibility by Stimulated Raman Scattering Imaging of D₂O Metabolic Incorporation in a Single Bacterium

Meng Zhang, Weili Hong,* Nader S. Abutaleb, Junjie Li, Pu-Ting Dong, Cheng Zong, Pu Wang, Mohamed N. Seleem, and Ji-Xin Cheng*



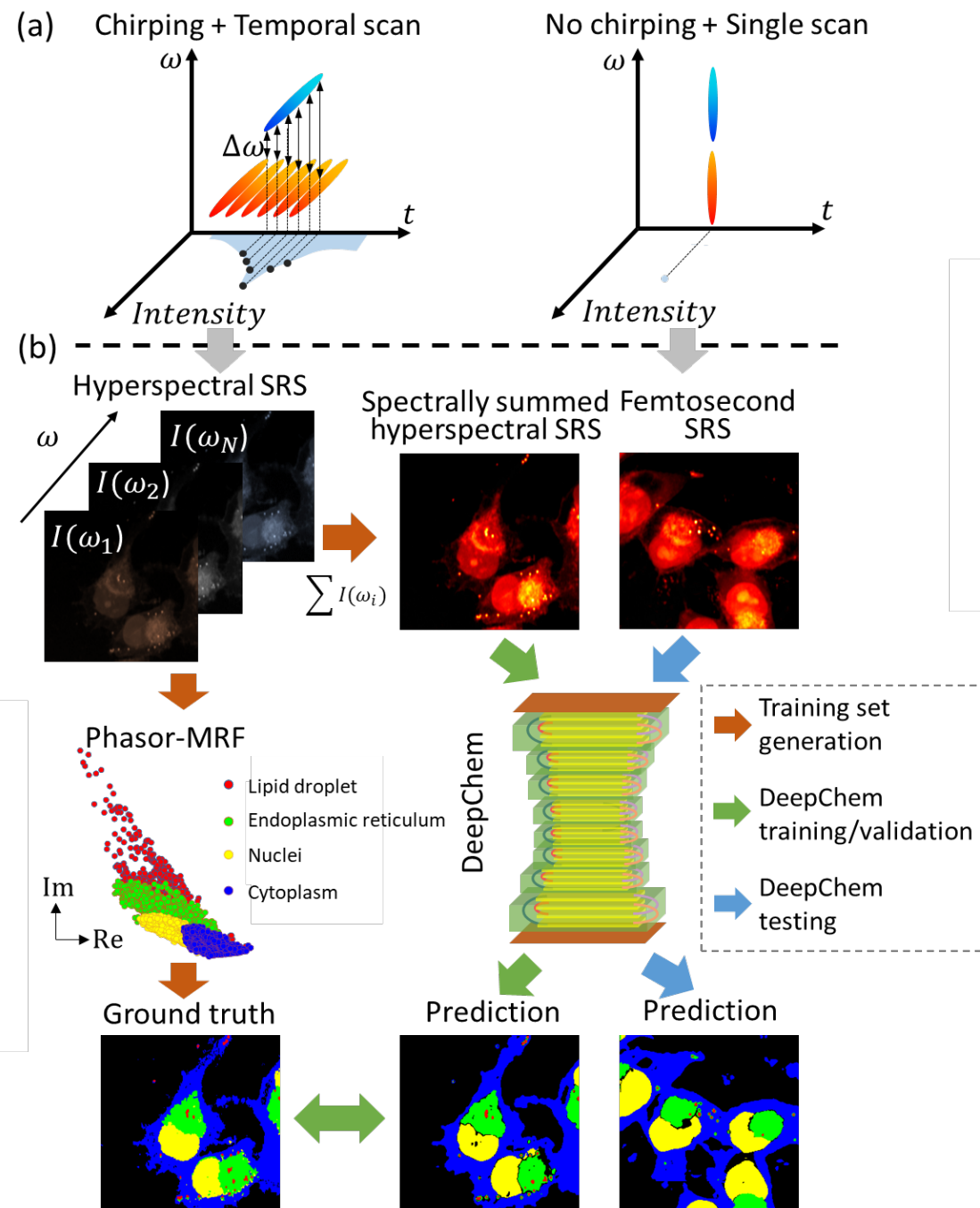
- ✓ Early & precise intervention
- ✓ Simplified workflow
- ✓ Low risk of contamination, low false positive rate
- ✓ High sensitivity at single bacterium level
- ✓ Potential in clinical use



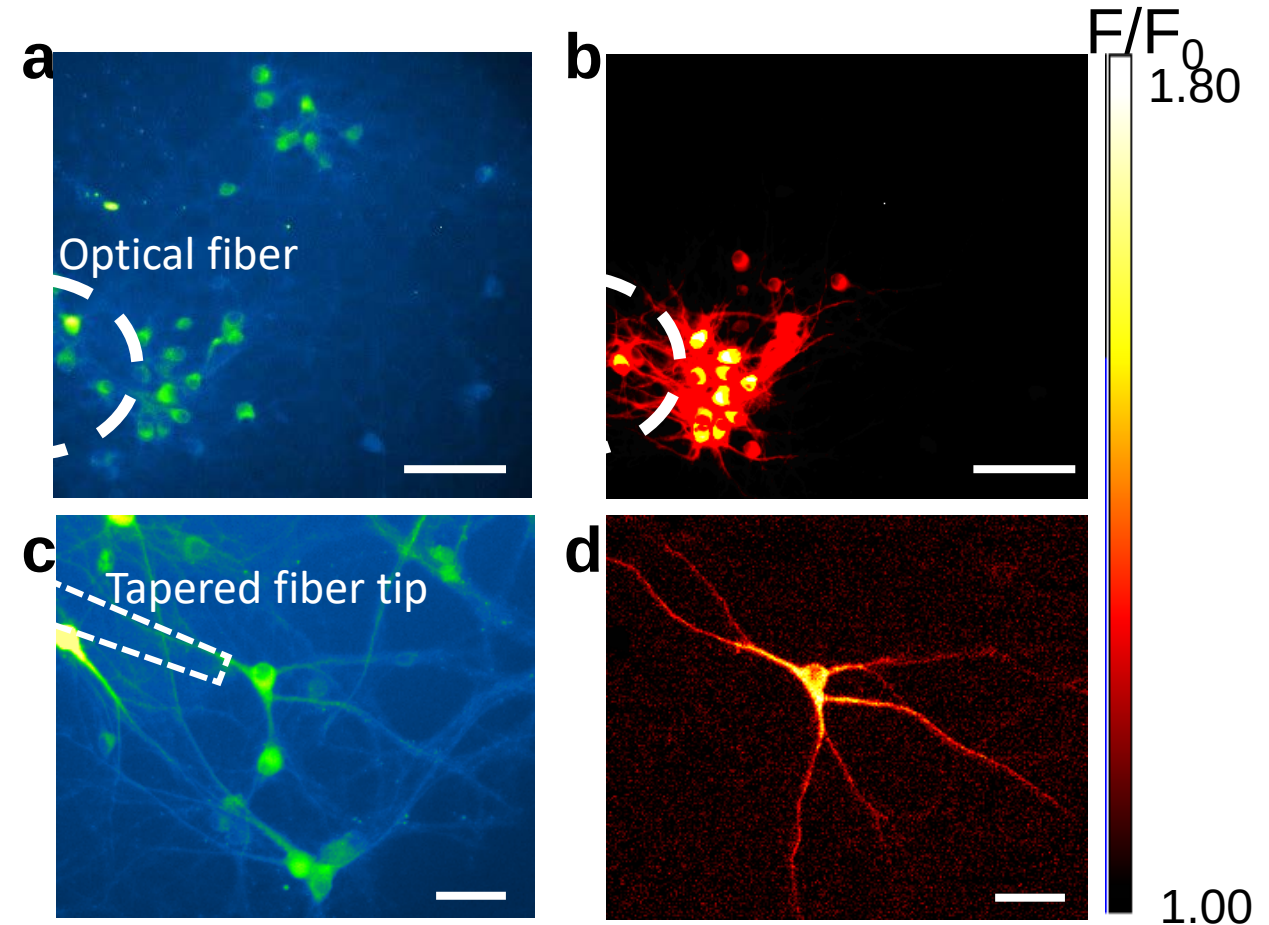
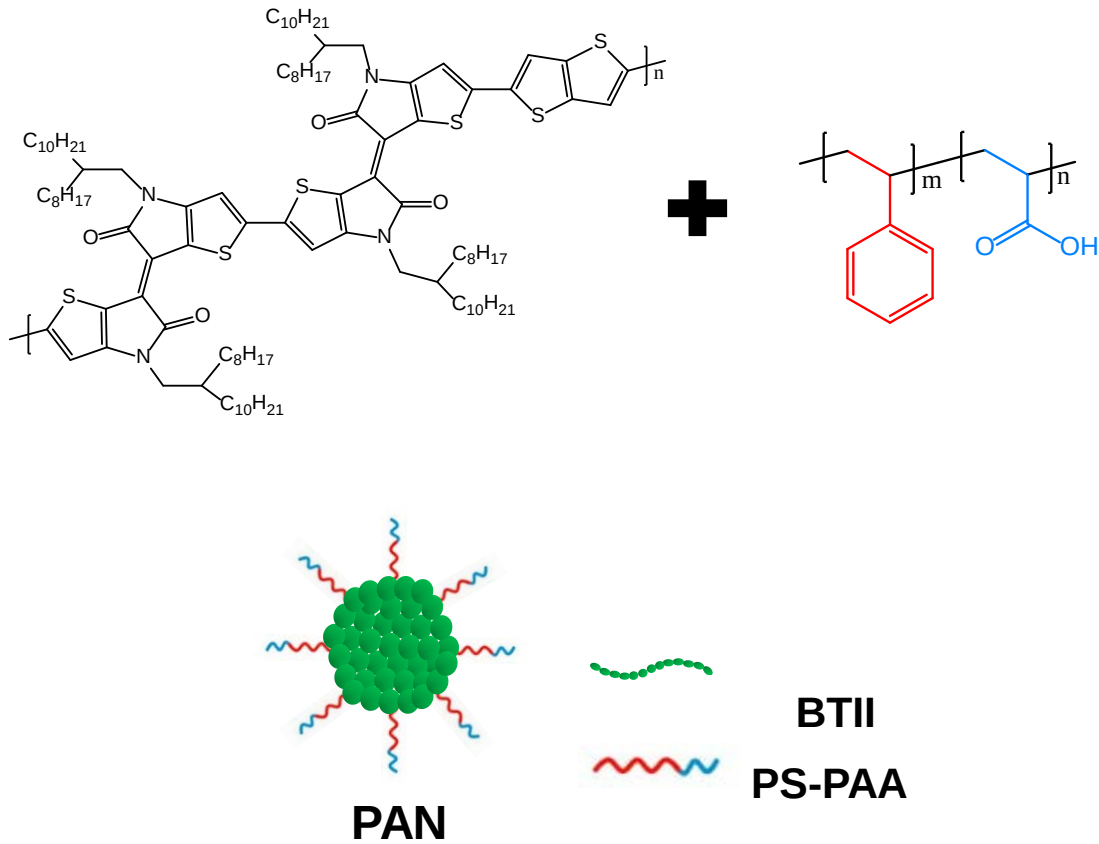
“High-Speed Chemical Imaging by Dense-Net Learning of Femtosecond Stimulated Raman Scattering”

Zhang, J., Zhao, J., Lin, H., Tan, Y. & Cheng, J.-X.

The Journal of Physical Chemistry Letters, 8573-8578, (2020)

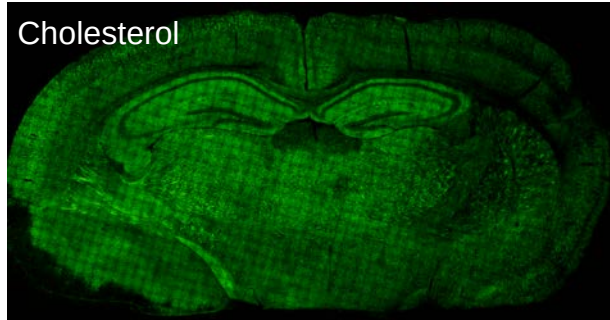
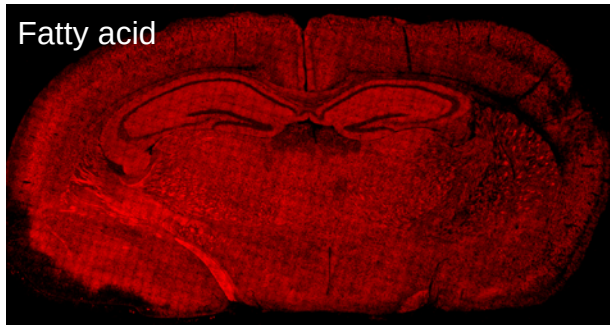
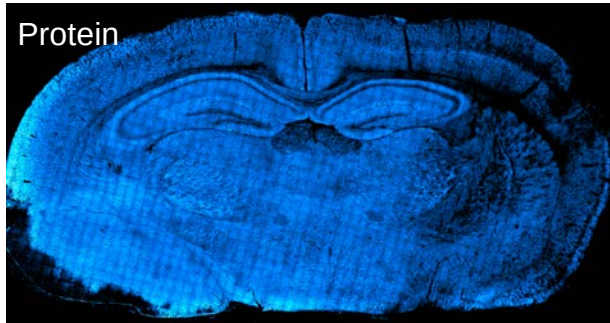


Photoacoustic nano-transducers PAN for high precision stimulation



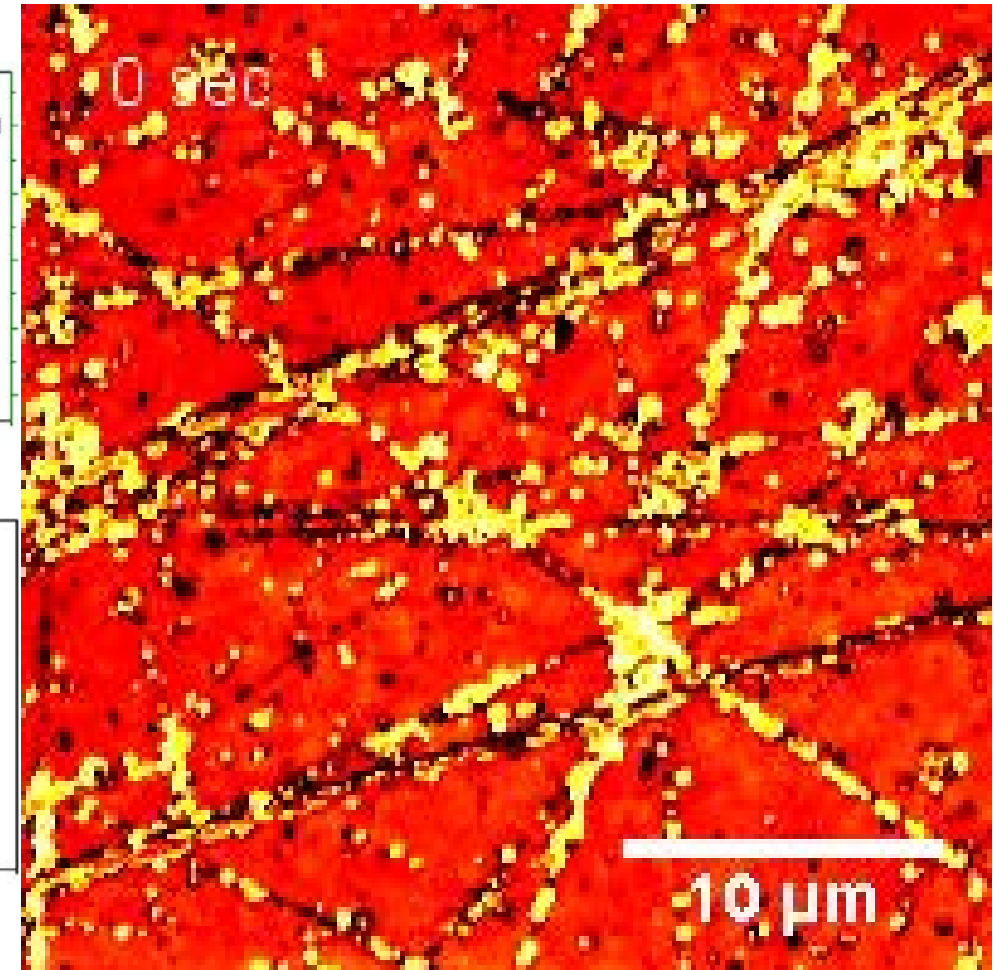
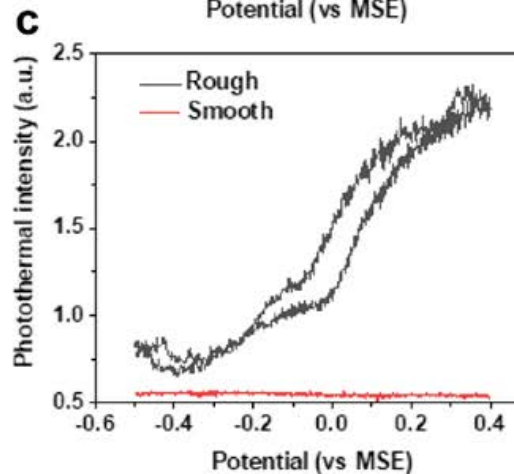
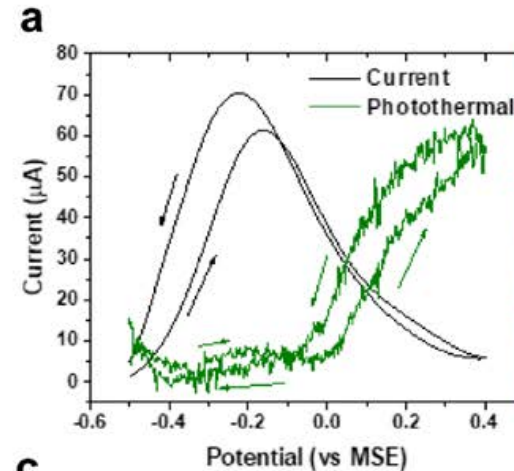
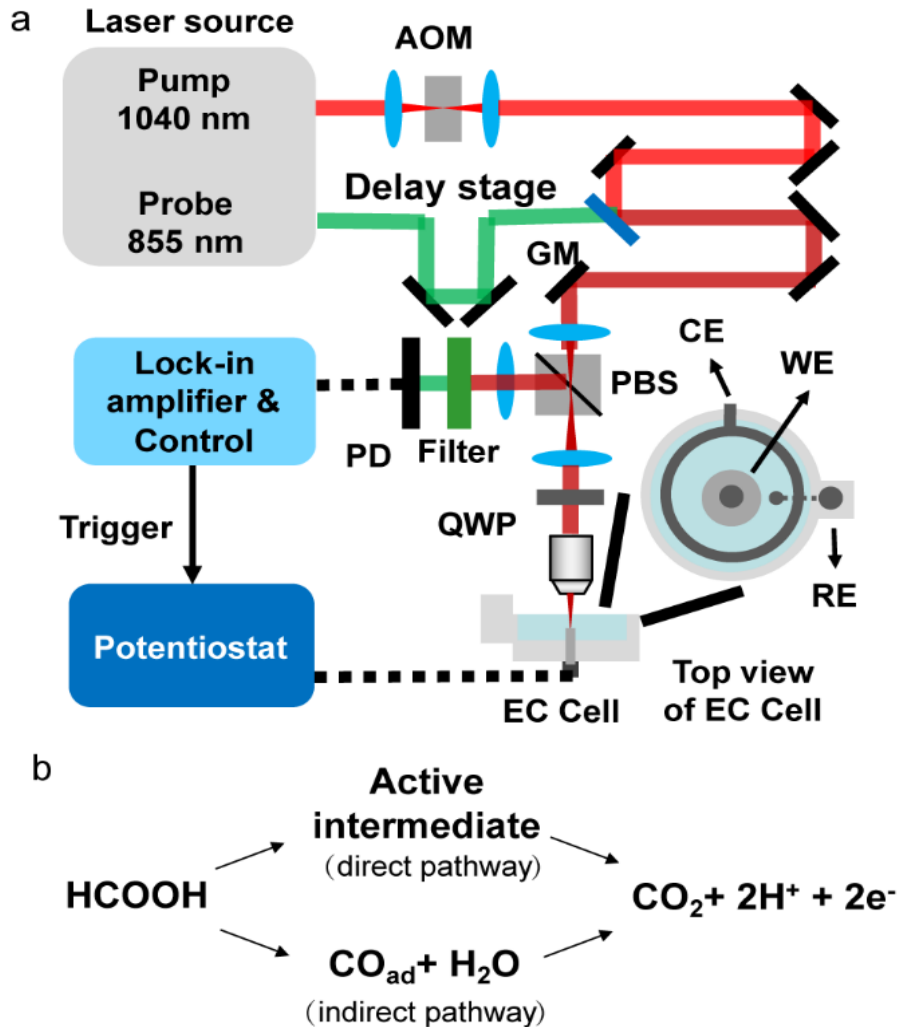
Chemical maps of mouse whole brain by Deep-learning SRS

Linear unmixing (pixel-wise LASSO) is applied to SNR-recovered image

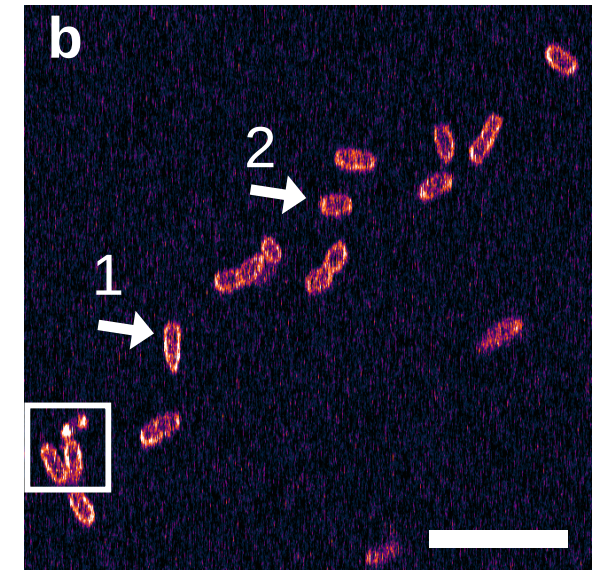
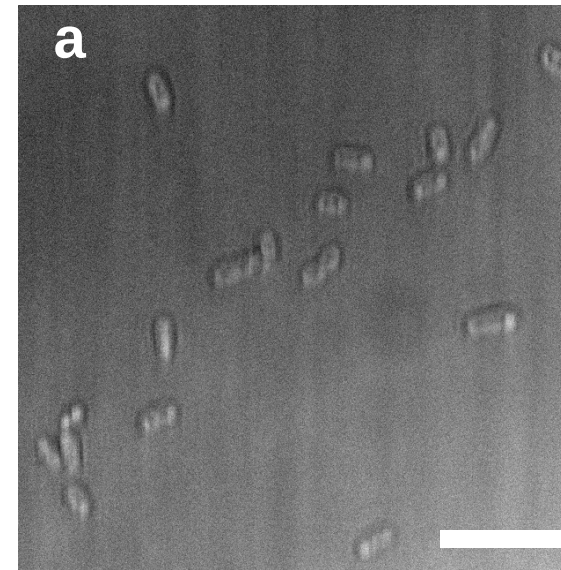
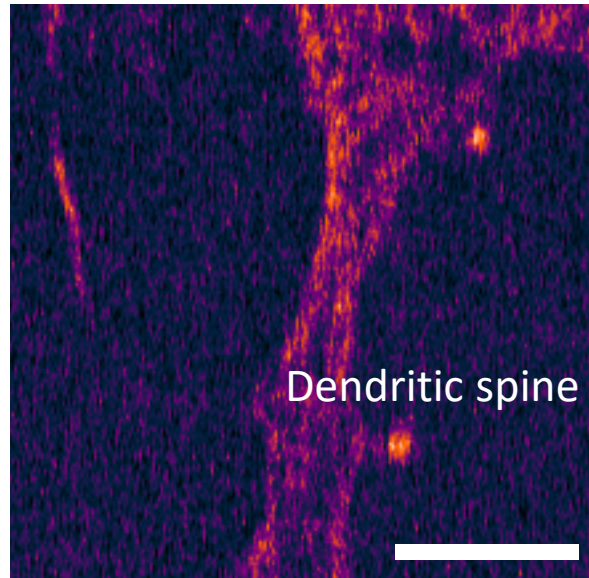
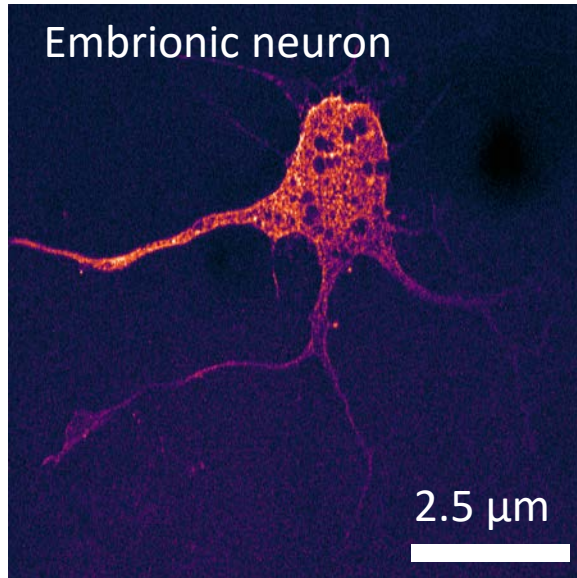


Haonan Lin,..., Ji-Xin Cheng, Nature Communications, minor revision

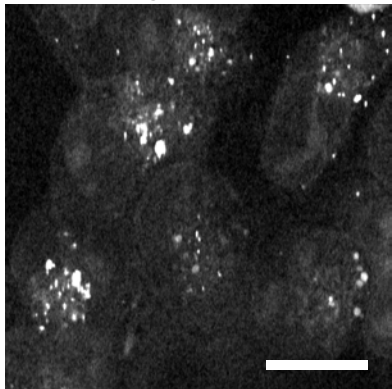
Real-time imaging of Surface Chemical Reactions by Electrochemical Photothermal Reflectance Microscopy



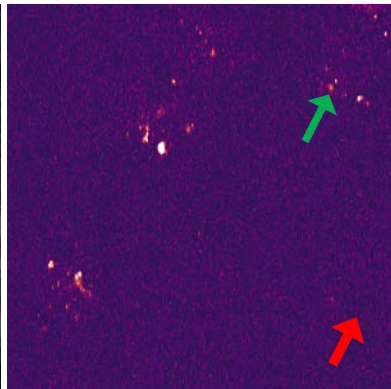
Ultrasensitive Chemical Imaging of Retinol by VP-SRS



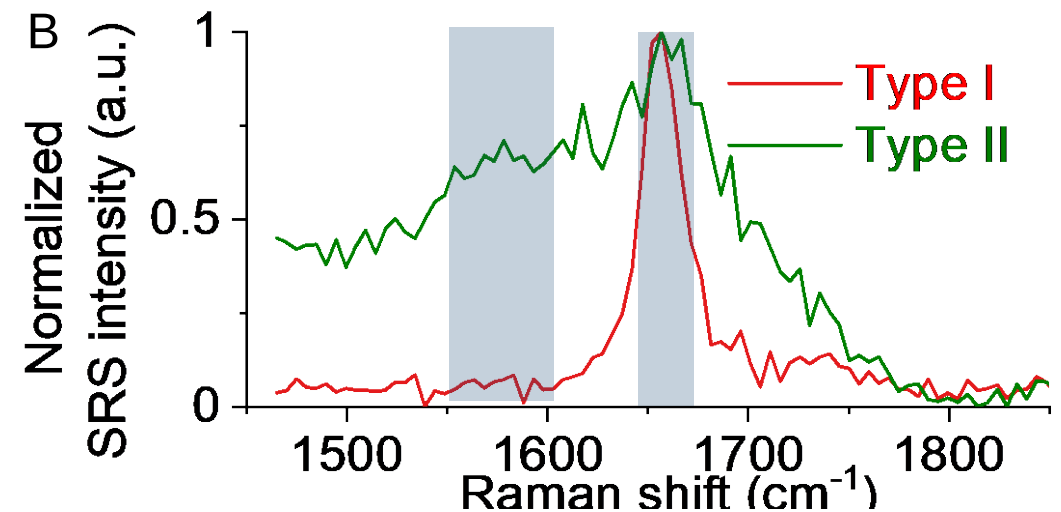
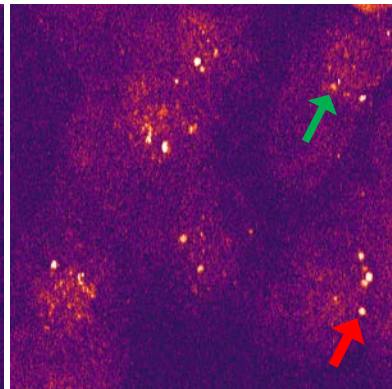
A SRS sum intensity



C=C (Retinoids) at 1580 cm^{-1}



Acyl C=C & amide I at 1655 cm^{-1}



Meta-optics for a virtual reality and augmented reality system

Zhaoyi Li¹, Peng Lin³, Yao-Wei Huang^{1,5}, Joon-Suh Park¹, Wei-Ting Chen¹, Zhujun Shi^{1,2}, Cheng-Wei Qiu⁵, Ji-Xin Cheng^{3,4}, Federico Capasso^{1*}

Science Advances, 2021, in press

