Ji-Xin Cheng Group

Progress in 2021

Current Ji-Xin Cheng Research Group

Ji-Xin Cheng (Principal Investigator)
Yvonne Cancino (Lab Manager)
Lu Lan (part-time research scientist)

- Vibronix
- Pulsethera
- Photothermal

CRS imaging

Lin, Haonan
Wang, Le
Lin, Peng
Ge, Xiaowei
Ni, Hongli
Zhang, Jing
Zhu, Yifan
Li, Chuan
Cheng, Ran
(Yang lab)
Xu, Xinxin (MS)

MIP imaging

Zong, Haonan
Guo, Zhongyue
Jia, Danchen
Li, Mingsheng
Xu, Yihong
Yin, Jiaze
Zhang, Yi
Zhao, Jian

Neuromodulation

Jiang, Ying
Li, Yueming
Marar, Carolyn
Wang, Runyu
(MS)

(Yang lab)
Chen, Guo
Zheng, Nan
Du, Zhiyi
Shi, Linli

Cell metabolism

He, Hongjian
Tan, Yuying
Dessai, Chinmayee
Teng, Xinyan
Chen, Fukai
(MS)

Microbiology

Zhang, Meng
Jusuf, Sebastian
Zhan, Yuewei
Wang, Zian (MS)

PA imaging

Zhang, Guangju
Li, Mingsheng

Areas Representatives

Summer 2021

- SRS and Raman --- Xiaowei Ge
- Photothermal & photoacoustic --- Yeran Bai
- Cell biology --- Meng Zhang
- Microbiology --- Sebastian Jusuf
- Neuromodulation --- Yueming Li

Spring 2022

- SRS and Raman --- Hongli Ni
- Photothermal & photoacoustic -- - Haonan Zong
- Cell biology --- Fukai Chen
- Microbiology --- Sebastian Jusuf
- Neuromodulation --- Nan Zheng

Fall 2021

- SRS and Raman --- Peng Lin
- Photothermal & photoacoustic --- Jian Zhao
- Cell biology --- Yuying Tan
- Microbiology --- Zian Wang
- Neuromodulation --- Linli Shi

Current funding

- NIH R35GM136223, R01HL125385, R01CA224275, R01AI141439, R01NS109794, R33CA261726
- NSF Chemical Imaging
- DoE
- Hologic
- Daylight Solutions
- Photothermal Spectroscopy Corp: R42CA244844, R43GM142346, R44EB027018

New Grants received in 2021

1. R33 CA261726 (2021 to 2024), $1.2 M
2. NIH SBIR Phase 1, Fluorescence enhanced-MIP, GM142346 $80,000, 2021
3. NIH R01 NS109794 admin supplement for dissemination of FOE, $300,000, 2021 to 2023
4. Daylight Solutions, Bond-selective phase imaging, $216,000, 2021 to 2022
5. Hologic, breast cancer detection by SRS microscopy, $300,000, 2021 to 2023
6. R01 EB032391-01, computational chemical imaging, $2,379,816, 2022 to 12/31/2025

Industrial Partners

- Hologic – breast cancer imaging
- Daylight Solutions – bond-selective phase imaging
- Photothermal Spectroscopy Corp
- Bruker – AFM
- Vibronix Inc -- AST
- Pendar Technologies – IR laser

Awards and honors

- Professor Hyeon Jeong Lee (former member), 35 innovators under 35!
- Carolyn Marar: Best poster award in 2021 QBP Research Symposium
- Haonan Lin: BME Department best paper of the year 2021

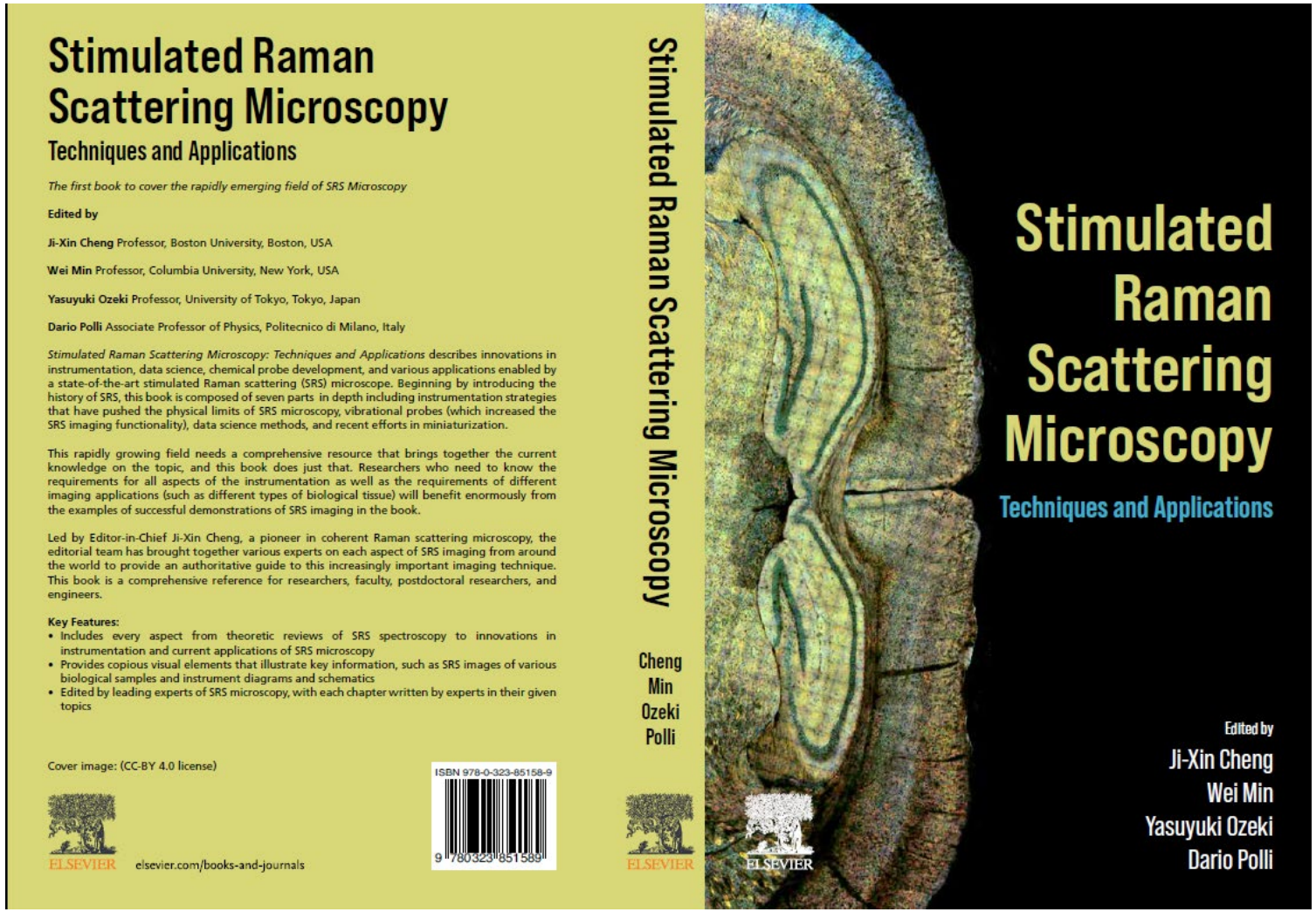
Career Advancement in 2021

1. Dr. Haonan Lin, graduated in Sept 2021, postdoc at BU till Aug 2022
2. Dr. Yi Zhang, thesis defense in Oct 2021. join Huawei 1/1/2022.
3. Dr. Yeran Bai, joined UCSB as a postdoc.
4. Dr. Cheng Zong, joined Bay Spec as a scientist.
5. Dr. Ying Jiang, to join MIT as postdoc, Jan 1, 2022
6. Dr. Zhicong Chen, joined Center of Reproductive Medicine, Key Laboratory for Reproductive Medicine of Guangdong Province, The Third Affiliated Hospital of Guangzhou Medical University, Guangzhou, China
7. Fukai Chen, MS, graduated in Sept 2021, research fellow at BU till Aug 2022
8. Zian Wang, MS, to graduate in Jan 2022, research fellow at BU till Aug 2022
9. Ruyu Wang, MS, to graduate in Jan 2022.
10. Cheng is appointed as director of photonics center graduate student initiative.

New members who joined us in 2021

1. Ms. Yvonne Cancino as Lab manager
2. Hongjian He (postdoc Brandeis University)
3. Qing Xia (Postdoc from Nanjing University)
4. Carolyn Marar (BME PhD, year 2)
5. Chinmayee Dessai (BME PhD, year 2)
6. Danchen Jia (ECE PhD, year 2)
7. Yihong Xu (Phys PhD, year 2)
8. Chuan Li (ECE PhD, year 1)
9. Mingsheng Li (ECE PhD, year 1)
10. Xinyan Teng (Chem PhD, year 1)
11. Yongjie Yang (ECE MS)
12. Zian Wang (BME MS)
13. Runyu Wang (ECE MS)
14. Xinxin XU (MSE MS)

New Book Published in Dec 2021



Stimulated Raman Scattering Microscopy

Techniques and Applications

The first book to cover the rapidly emerging field of SRS Microscopy

Edited by

Ji-Xin Cheng Professor, Boston University, Boston, USA

Wei Min Professor, Columbia University, New York, USA

Yasuyuki Ozeki Professor, University of Tokyo, Tokyo, Japan

Dario Polli Associate Professor of Physics, Politecnico di Milano, Italy

Stimulated Raman Scattering Microscopy: Techniques and Applications describes innovations in instrumentation, data science, chemical probe development, and various applications enabled by a state-of-the-art stimulated Raman scattering (SRS) microscope. Beginning by introducing the history of SRS, this book is composed of seven parts in depth including instrumentation strategies that have pushed the physical limits of SRS microscopy, vibrational probes (which increased the SRS imaging functionality), data science methods, and recent efforts in miniaturization.

This rapidly growing field needs a comprehensive resource that brings together the current knowledge on the topic, and this book does just that. Researchers who need to know the requirements for all aspects of the instrumentation as well as the requirements of different imaging applications (such as different types of biological tissue) will benefit enormously from the examples of successful demonstrations of SRS imaging in the book.

Led by Editor-in-Chief Ji-Xin Cheng, a pioneer in coherent Raman scattering microscopy, the editorial team has brought together various experts on each aspect of SRS imaging from around the world to provide an authoritative guide to this increasingly important imaging technique. This book is a comprehensive reference for researchers, faculty, postdoctoral researchers, and engineers.

Key Features:

- Includes every aspect from theoretic reviews of SRS spectroscopy to innovations in instrumentation and current applications of SRS microscopy
- Provides copious visual elements that illustrate key information, such as SRS images of various biological samples and instrument diagrams and schematics
- Edited by leading experts of SRS microscopy, with each chapter written by experts in their given topics

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Techniques and Applications

Edited by
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Wei Min
Yasuyuki Ozeki
Dario Polli

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Peer Reviewed Articles in 2021 (total 24)

Nature Reviews Methods Primers (1) review
Nature Communications (2)
Light S&A (1)
Science Advances (2)
Science Advances (1) review article
BME Frontiers (1)
Molecular Cell (1)
Matter (1)
JACS (1)
Chemical Science (1)
Advanced Science (1)
Cancer Research (1)
ACS Photonics (1)
Analytical Chemistry (3)
J Chem Phys (1)
Photobiology and Photochemistry (1)
J Phys D (1)
APL Photonics (1)
Cancers (1) review article
JoVE (1)

Peer Reviewed Articles in 2021

276. Sebastian Juruf, Pu-Ting Dong, Jie Hui, Erlinda R. Ulloa, George Y. Liu, Ji-Xin Cheng, “Granadaene Photobleaching Reduces *Streptococcus agalactiae* Virulence and Increases Its Susceptibility to Antimicrobials”, **Photobiology and Photochemistry**, 2021, **DOI: 10.1111/php.13389**

275. Jiayingzi Wu, Liyan You, Saadia T. Chaudhry, Jiazhi He, Ji-Xin Cheng, and Jianguo Mei, Ambient Oxygen-Doped Conjugated Polymer for pH-Activatable Aggregation-Enhanced Photoacoustic Imaging in the Second Near-Infrared Window, **Analytical Chemistry**, 2021, 6: 3189-95.

274. Minghua Zhuge, Kai-Chih Huang, Hyeon Jeong Lee, Ying Jiang, Yuying Tan, Haonan Lin, Pu-Ting Dong, Guangyuan Zhao, Daniela Matei, Qing Yang, Ji-Xin Cheng, “Ultra-Sensitive Vibrational Imaging of Retinoids by Visible Pre-resonance Stimulated Raman Scattering Microscopy”, **Advanced Science**, 2021, 8:2003136.

273. Cheng Zong, Yurun Xie, Yimin Huang, Chen Yang, Ji-Xin Cheng*, “PECARS versus PESRS, comparison of line shapes and signal to noise ratio”, **Journal of Chemical Physics**. 2021 Special issue, 154, 034201.

272. 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**, 2021, 81: 384-399.

271. 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, 7: eabv4458.

270. 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, 7: eabd5230.

269. 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, 4: 1-21.

268. 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, 12, 1930-1936. Edge article

Peer Reviewed Articles in 2021

284. Linli Shi, Ying Jiang, Fernando R. Fernandez, Guo Chen, Lu Lan, Heng-ye Man, John A. White, Ji-Xin Cheng*, Chen Yang*. Non-genetic photoacoustic stimulation of single neurons by a tapered fiber optoacoustic emitter, **Light S&A**, 2021, 10:143.

283 Yi Zhang, Haonan Zong, Cheng Zong, Yuying Tan, Meng Zhang, Yuewei Zhan, Ji-Xin Cheng*, Fluorescence-detected mid-infrared photothermal microscopy, **Journal of American Chemical Society**, 2021, 143:11490-9.

282. Celalettin Yurdakul, Haonan Zong, Yeran Bai, Ji-Xin Cheng*, and M Selim Ünlü*, Bond-selective interferometric scattering microscopy, **Journal of Physics D: Applied Physics**, 2021, 54: 364002

281. Zhang, M., Seleem, M.N., Cheng, J.X*, Rapid Antimicrobial Susceptibility Testing by Stimulated Raman Scattering Imaging of Deuterium Incorporation in a Single Bacterium, **JoVE**, 2021, e62398, doi:10.3791/62398 (2021)

280. Yeran Bai, Jiaze Yin, Ji-Xin Cheng*, "Bond-Selective Imaging by Optically Sensing the Mid-Infrared Photothermal Effect", **Science Advances**, review, 2021, 7: eabg1559. May 2021

279. Haonan Lin, Hyeon Jeong Lee, Nathan Tague, Jean-Baptiste Lugagne, Cheng Zong, Fengyuan Deng, Tian Lei, Wilson Wong, Mary Dunlop and Ji-Xin Cheng*. "Fingerprint Spectroscopic SRS Imaging of Single Living Cells and Whole Brain by Ultrafast Tuning and Spatial-Spectral Learning", **Nature Communications**, 2021, 12:3052. Published on 5/24/2021.

278. Jiabao Xu, Tong Yu, Christos E Zois, Ji-Xin Cheng, Yuguo Tang, Adrian L. Harris, Wei Huang, Unveiling cancer metabolism through spontaneous and coherent Raman spectroscopy and stable isotope probing. **Cancers**, 2021, 13, 1718. review

277. Yi Zhang, Celalettin Yurdakul, Alexander J. Devaux, Le Wang, Xiaoji G. Xu, John H. Connor*, M. Selim Ünlü*, and Ji-Xin Cheng*, Vibrational Spectroscopic Detection of a Single Virus by Mid-Infrared Photothermal Microscopy, **Analytical Chemistry**, 2021, 93: 4100-07.

Peer Reviewed Articles in 2021

291. Jiaze Yin, Lan Lu, Yi Zhang, Hongli Ni, Yuying Tan, Meng Zhang, Yeran Bai, Ji-Xin Cheng, Nanosecond-resolution photothermal dynamic imaging via MHZ digitization and match filtering, **Nature Communications**, 2021, 12: 7097.

290. Lee, K. S.; Landry, Z.; Pereira, F. C.; Wagner, M.; Berry, D.; Huang, W. E.; Taylor, G. T.; Kneipp, J.; Popp, J.; Zhang, M.; Cheng, J.-X.; Stocker, R., Raman microspectroscopy for microbiology. **Nature Reviews Methods Primers** 2021, 1 :80.

289. Ni, H.; Lin, P.; Zhu, Y.; Zhang, M.; Tan, Y.; Zhan, Y.; Wang, Z.; Cheng, J. X., Multiwindow SRS Imaging Using a Rapid Widely Tunable Fiber Laser. **Analytical Chemistry** (2021).

288. Haonan Zong, Celalettin Yurdakul, M. Selim Unlü*, Ji-Xin Cheng*, Contrast-enhanced high-throughput mid-infrared photothermal imaging through pupil engineering, **ACS Photonics**, 2021

287. H.J. Lee, Z. Chen, M. Collard, F. Chen, J.G. Chen, M. Wu, R.M. Alani, J.-X. Cheng, Multimodal Metabolic Imaging Reveals Pigment Reduction and Lipid Accumulation in Metastatic Melanoma, **BME Frontiers**, 2021 (2021) article ID 9860123.

286. Lulu Jiang, Weiwei Lin, Cheng Zhang, Peter E.A. Ash, Mamta Verma, Julian Kwan, Emily van Vliet, Zhuo Yang, Anna Lourdes Cruz, Samantha Boudeau, Brandon F. Maziuk, Shuwen Lei, Jaehyup Song, Victor E. Alvarez, Stacy Hovde, Jose F. Abisambra, Min-Hao Kuo, Nicholas Kanaan, Melissa E. Murray, John F. Crary, Jian Zhao, Ji-Xin Cheng, Leonard Petrucelli, Hu Li, Andrew Emili, Benjamin Wolozin, Interaction of tau with HNRNPA2B1 and N6 -methyladenosine RNA mediates the progression of tauopathy, **Molecular Cell**, 2021, 81, 1-19.

285. Peng Lin, Wei-Ting Chen, Kerolos M.A. Yousef, Justin Marchioni, Alexander Zhu, Federico Capasso, Ji-Xin Cheng, Coherent Raman scattering imaging with a near-infrared achromatic metalens, **APL Photonics**. 2021, 6: 096107.

Important Group Events in 2021

- Group outing / Cheng's 50th Birthday
- Yeran and Ying wedding ceremony


HAWKEYE