Yunteng Cao

Department of Molecular, Cellular & Developmental Biology, Yale University
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Education

Massachusetts Institute of Technology — Cambridge, MA
Ph.D., Structures and Materials (Advisor: Benedetto Marelli) — *Sep 2016 – Sep 2022*
Thesis: *Precision Delivery of Multi-Scale Payloads to Tissue-Specific Targets in Plants*

Xi'an Jiaotong University — Xi'an, China
M.Eng., Mechanics (Advisors: Xi Chen; Yilun Liu) — *Sep 2013 – Jun 2016*
Thesis: *A Novel Slithering Locomotion Mechanism for Snake-like Soft Robot*

Shanghai Jiao Tong University — Shanghai, China
B.Eng., Engineering Mechanics (Advisor: Xiaobo Gong) — *Sep 2009 – Jul 2013*
Thesis: *Numerical Simulation of the Behaviors of Solid Particles in a Microchannel*

Academic Appointments

Yale University — New Haven, CT
Postdoctoral Associate, Molecular, Cellular and Developmental Biology (Advisor: Farren Isaacs) — *Nov 2023 – Present*

Massachusetts Institute of Technology — Cambridge, MA
Postdoctoral Associate, Civil and Environmental Engineering (Advisor: Benedetto Marelli) — *Sep 2022 – Oct 2023*

Massachusetts Institute of Technology — Cambridge, MA
Graduate Research Assistant, Civil and Environmental Engineering (Advisor: Benedetto Marelli) — *Sep 2016 – Aug 2022*

Research Interests

Biomaterials: Naturally derived biopolymers; Programmed proteins with expanded chemistry; Engineered living materials; Micro/nano materials

Mechanics, Design & Manufacturing: Solid mechanics; Mechanics of living systems; Soft robotics; Micro/nanofabrication

Bioengineering: Biomanufacturing; Engineered living sensors and therapeutic systems

Precision Agriculture & Healthcare: Microneedle-mediated and nano-enabled delivery, sampling, and sensing

Selected Awards & Honors

2025 SES Future Faculty Symposium Award, 2025 SES Annual Technical Meeting, 2025

Postdoctoral Scholars Travel Fund Award, Yale University, 2025

2023 Rising Stars in Materials Science and Engineering, organized by CMU, MIT & Stanford, 2023

CEE Best Doctoral Thesis Award, Department of Civil and Environmental Engineering, MIT, 2023

IEEE Robotics and Automation Letters Distinguished Service Award, Outstanding Reviewer, 2023

Ho-Ching and Han-Ching Fund Award, Office of Graduate Education at MIT, 2020

MIT Water Innovation Prize Winner, team award for change:WATER Labs, 2017

MIT $100k Entrepreneurship Competition Audience-Choice-Award, team award for change:WATER Labs, 2017

Excellent Youth Leader Award, Xi'an Jiaotong University, 2015

Excellent Postgraduate Award (Top 10%), Xi'an Jiaotong University, 2014

Shanghai Outstanding Graduate Award (Top 1%), Shanghai Municipal Education Commission, 2013

Xu Zhi-Lun Award of Excellent Student of Mechanics, Chinese Society of Theoretical and Applied Mechanics, 2012

National Encouragement Scholarship of China, Chinese Ministry of Education, 2010, 2011, 2012

Second Prize (individual) and First Prize (team) of "8th National Zhou Peiyuan Mechanics Competition of China", Chinese Society of Theoretical and Applied Mechanics (CSTAM), 2011

First-class Scholarship Award (Top 1%), Shanghai Jiao Tong University, 2011

Proposal Writing Experience

Disruptive & Sustainable Technologies for Agricultural Precision (DiSTAP) — Singapore-MIT Alliance for Research Technology, National Research Foundation, Prime Minister's Office, Singapore under its Campus for Research Excellence and Technological Enterprise (CREATE) program). **PI**: Multi-PIs from MIT and TLL in Singapore, including Prof. Benedetto Marelli. Awarded: **$40M** (since 2018), renewed in 2022 for an additional **$40M**. **Role:** Provided preliminary data and co-drafted a major section, *"Silk Technology for a More Resilient Agri-Food System."*

Precise Fish Vaccine Injection Using Silk-Based Biomaterials — Abdul Latif Jameel Water and Food Systems Lab (J-WAFS) Seed Grant, MIT; **PI**: Prof. Benedetto Marelli. Awarded: **$150k** (Sep 2021 – Aug 2023); follow-on work supported by USDA. **Role:** Provided preliminary data and contributed to proposal drafting.

Research Experience

Postdoctoral Associate 11/2023-present
Department of Molecular, Cellular and Developmental Biology, Yale University, USA
Advisor: Prof. Farren Isaacs

Genome engineering and genetic code expansion

- Engineering genetically recoded organisms to enhance cell fitness
- Evolving orthogonal translation systems in genetically recoded organisms to efficiently incorporate non-standard amino acids for biosynthesis of proteins with expanded chemistry, such as post-translational modifications

Postdoctoral Associate 08/2022-10/2023
Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, USA
Advisor: Prof. Benedetto Marelli

Nanofabrication of microneedles for high throughput micronutrients delivery and continuous plant health monitoring

- Developed a scalable method to fabricate polymeric microneedles with micro/nano- structures via simultaneous manipulation of silk fibroin assembly with inorganics nucleation at their phase front
- Demonstrated the delivery of micronutrients to plants to address deficiencies, and crop fortifiers (e.g., vitamin B12) into tomato fruits for nutrient enrichment using silk-based hollow microneedles
- Demonstrated continuous sap sampling from plants and visualization of deep tissues using silk-based hollow microneedles

Vapor-enabled manufacturing of spiky silk microspheres

- Simulated the formation of spiny structures on silk microspheres in responses to humidity changes

Graduate Research Assistant 09/2016-08/2022
Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, USA
Advisor: Prof. Benedetto Marelli

Precision delivery of multi-scale payloads to tissue-specific targets in plants

- Designed and fabricated a plant-compatible, protein-based microneedle tool that enables access to deeper plant tissues (e.g., vasculature, meristems) and demonstrated microneedles' utility for precise payloads delivery and sampling
- Analyzed plants' responses to microneedle injection
- Incorporated advanced sensors into silk-based microneedles for plant health monitoring

Microneedle sensors for detection of food contamination

- Developed a porous silk-based microneedle array with printed polydiacetylene-based bioinks on its substrate that can detect pathogenic bacteria in food

Fabrication of silk-based microneedles for vaccination

- Developed an efficient and fast fabrication method for silk-based microneedles using ultrasonic spraying

Visiting PhD Student 05/2019-08/2019
TLL Temasek Life Sciences Laboratory, Singapore
Advisor: Prof. Benedetto Marelli, Prof. Nam-Hai Chua, Dr. Pil Joong Chung

Regulation of flowering of tomato plants by delivering FT-like proteins via microneedles

- Bioproduced FT-like proteins of tomato plants in engineered *E coli*
- Used silk-based microneedles to deliver recombinant FT-like proteins into tomato plants to regulate flowering

Postgraduate Research Assistant 09/2013-06/2016
Department of Solid Mechanics, Xi'an Jiaotong University, China
Advisor: Prof. Xi Chen, Prof. Yilun Liu

Energy absorption by nanofluidics

- Tested the behaviors of nanofluidics under quasi-static compression and impact to design energy absorption materials

A novel slithering locomotion mechanism for snake-like soft robots

- Proposed a novel slithering locomotion mechanism for snake-like soft robots fabricated from metamaterials with negative Poisson's ratio
- Carried out FEM simulations to investigate factors such as curvature, Poisson's ratio
- Manufactured pneumatic snake-like soft robots

Rational design of 3D metamaterial with tunable negative Poisson's ratio

- Designed 3D metamaterials with tunable negative Poisson's ratio by harnessing instability and numerically simulated their deformation behaviors
- Modeled the deformation behaviors of metamaterials theoretically to predict the Poisson's ratio

Teaching Experience

1.060&1.060a Fluid Mechanics (undergraduate level, TA), 2022 & 2023 Spring

- Improved teaching materials including problem sets and their solutions
- Provided recitations (4h/week) on fundamental concepts and held office hours for illustration on problem sets
- Guided in-lab experiments for class and graded problem sets and exams

1.579 Materials in Agriculture (graduate student level, TA), Fall 2022

- Guided in-lab experiments for class, supported in-class projects, and graded problem sets

Kaufman Teaching Certificate Program, Spring 2022

- Learned evidence-based teaching techniques grounded in the scholarship of teaching and learning, including designing a course, preparing a lesson plan, assessing and providing feedback to students, creating an effective and welcoming classroom climate etc.
- Actively practiced teaching skills through two microteaching workshops

Training for Dynamic Mechanical Analyzer at MIT Institute for Soldier Nanotechnologies (Steward), 2017-2022

- Provided training for >200 researchers with various backgrounds across MIT in 5 years

Mentoring Experience

Undergraduate Research Mentoring

- **Elizabeth Fisher** (Yale, Spring 2025–present) — Genome engineering of genomically recoded E. coli; training in project design and wet benchwork. Elizabeth received the Yale First-Year Summer Research Fellowship (2025).
- **Mercedes L. Escandon**; **Chang Grace Xu** (MIT, Jan 2022) — Supervised mini-UROP: project design, wet-bench execution, and final presentation.
- **Timothy Roberts** (MIT, 2017–2019) — Supervised UROP: project design, wet-bench experiments, data analysis, and final presentation. Timothy won the Juan Hermosilla (1957) Prize (MIT CEE).

Discovery to Cure High School Internship Program

- **Audrey Zelezniak Berezowski** (Yale, Summer 2024) — 6-week wet-lab project; mentored experimental design and final presentation. (Now at Emory University.)

Mentorship & Leadership Training

- *Postdoc Fundamental Mentorship Intensive* (Yale, Spring 2025)— Frameworks for mentor–mentee alignment, communication, equity/inclusion, self-efficacy, fostering independence, professional development, and work–life integration.
- *Practicing Leadership* (Yale Workshop Series, Fall 2024) — Inclusive leadership, communication strategies, project management, and navigating institutional change.

Publications

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Submitted manuscripts (# indicates equal contribution)

1. Michael T. A. Nguyen#, **Yunteng Cao**#, Michael W. Grome, Kebron Gurara, Maya Kornaj, Svetlana Rogulina, Jesse Rinehart, Farren J. Isaacs, *Biomanufacturing proteins with expanded chemistry using next-gen genomically recoded organisms*, **Submitted**.
2. Sally Shuxian Koh#, Meng Li#, **Yunteng Cao**, Kasey Goh, Benedetto Marelli, Daisuke Urano, *Biomaterials designer for plant-microneedle interfaces*, **Submitted**.
3. Raju Cheerlavancha#, Benny Jian Rong Sng#, Duc Thinh Khong#, **Yunteng Cao**, Thomas K. Porter, Dicky Pranantyo, Mervin Chun-Yi Ang, Song Wang, Yangyang Han, Ganga Sravanthi G, Suh In Loh, Maxwell Kalinowski, Gajendra Pratap Singh, Michael S. Strano, In-Cheol Jang, Benedetto Marelli, *Silk Microneedles Carrying SWNT-CoPhMoRe Nanosensors for Early Detection of Shade Avoidance Syndrome In Planta*, **Submitted**.

Peer-reviewed publications (# indicates equal contribution)

1. **Yunteng Cao**#, Doyoon Kim#, Sally Shuxian Koh, Zheng Li, Federica Rigoldi, Julia Eva Fortmueller, Kasey Goh, Yilin Zhang, Eugene J. Lim, Hui Sun, Elise Uyehara, Raju Cheerlavancha, Yangyang Han, Rajeev J. Ram, Daisuke Urano, Benedetto Marelli, *Nanofabrication of silk microneedles for high-throughput micronutrient delivery and continuous sap monitoring in plants*, **Nature Nanotechnology**, 2025. DOI: 10.1038/s41565-025-01923-2
2. **Yunteng Cao**#, Sally Shuxian Koh#, Yangyang Han, Javier Jingheng Tan, Doyoon Kim, Nam-Hai Chua, Daisuke Urano, Benedetto Marelli, *Drug delivery in plants using silk microneedles*, **Advanced Materials**, 2205794, 2022. DOI: 10.1002/adma.202205794
3. **Yunteng Cao**, Masoud Derakhshani, Yuhui Fang, Guoliang Huang, Changyong Cao, *Bistable structures for advanced functional systems*, **Advanced Functional Materials**, 2106231, 2021. DOI: 10.1002/adfm.202106231
4. Heyu Yin#, **Yunteng Cao**#, Benedetto Marelli, Xiangqun Zeng, Andrew J. Mason, Changyong Cao, *Soil sensors and plant wearables for smart and precision agriculture*, **Advanced Materials**, 33(20), 2007764, 2021. DOI: 10.1002/adma.202007764
5. **Yunteng Cao**, Eugene Lim, Menglong Xu, Jing-Ke Weng, Benedetto Marelli, *Precision delivery of multiscale payloads to tissues specific targets in plants*, **Advanced Science**, 7(13), 1903551, 2020. DOI: 10.1002/advs.201903551
6. **Yunteng Cao**, Yilun Liu, Youlong Chen, Liangliang Zhu, Yuan Yan, Xi Chen, *A novel slithering locomotion mechanism for a snake-like soft robot*, **Journal of the Mechanics and Physics of Solids**, 99, 304-320, 2017. DOI: 10.1016/j.jmps.2016.11.019
7. Yaping Xu, Rui Liu, Yu Chu, Yuxiang Xu, Chenyang Dang, Tao Zhang, Xiaofeng Fang, Bing Han, Peng Li, **Yunteng Cao**, Guiyin Xu, Meifang Zhu, *Hierarchically Structured Hollow Fiber Membranes for Efficient, Selective, and Scalable Mercury Ion Removal from Water*, **Advanced Materials**, 2507014, 2025. DOI: 10.1002/adma.202507014
8. Jia Zhang, Zhongxiu Liu, Chenyang Dang, Xiaoqing Zhu, Tao Zhang, Jing Shen, Hao Yang, Yujie Zhang, **Yunteng Cao**, Chris Y Yuan, C Chase Cao, Guiyin Xu, Meifang Zhu, *From lab to industry: High-safety separators for lithium-ion/-metal batteries*, **Matter**, 8, 6, 2025. DOI: 10.1016/j.matt.2025.102101
9. Tao Zhang, Xiaoqing Zhu, Jiyang Xiong, Zhixin Xue, **Yunteng Cao**, Keith C Gordon, Guiyin Xu, Meifang Zhu, *Electron displacement polarization of high-dielectric constant fiber separators enhances interface stability*, **Nature Communications**, 16, 4867, 2025. DOI: 10.1038/s41467-025-60256-9
10. Yangyang Han, Monika Jangir, Amanda Si Yi Ngoh, Chunhong Li, Sreelatha Sarangapani, **Yunteng Cao**, Yilin Zhang, Raju Cheerlavancha, Rajani Sarojam, Benedetto Marelli, *Precise delivery of physiological doses of melatonin in planta to control postharvest physiology and extend shelf life outside the cold chain*, **Nano Letter**, 25, 22, 8859–8868, 2025. DOI: 10.1021/acs.nanolett.5c00487
11. Michael W. Grome, Michael T. A. Nguyen#, Daniel W Moonan#, Kyle Mohler#, Kebron Gurara1#, Shenqi Wang, Colin Hemez, Benjamin Stenton, **Yunteng Cao**, Felix Radford, Maya Kornaj, Jaymin Patel, Maisha Prome, Svetlana Rogulina, David Sozanski, Jesse Tordoff, Jesse Rinehart, Farren J. Isaacs, *Engineering a genomically recoded organism with one stop codon*, **Nature**, 639, 512–521, 2025. DOI: 10.1038/s41586-024-08501-x
12. Yilin Zhang, Jinwoo Shin, Hui Sun, Hsin-Fang Chang, Michael R. Martinez, Lydia A. Perkins, Jiajun Yan, **Yunteng Cao**, Hairong Wang, Juan Pablo Giraldo, Krzysztof Matyjaszewski, Jen Sheen, Robert D. Tilton, Benedetto Marelli, Gregory V. Lowry, *High aspect ratio polymer nanocarriers for gene delivery and expression in plants*, **Nano Letter**, 25(2), 681–690, 2025. DOI: 10.1021/acs.nanolett.4c04704
13. Song Wang, Yangyang Han, Vaishnavi Amarr Reddy, Mervin Chun-Yi Ang, Gabriel Sánchez-Velázquez, Jolly Madathiparambil Saju, **Yunteng Cao**, Duc Thinh Khong, Praveen Kumar Jayapal, Raju Cheerlavancha, Suh In Loh, Gajendra Pratap Singh, Daisuke Urano, Sarojam Rajani, Benedetto Marelli, and Michael S. Strano, *Chromatic covalent organic frameworks enabling in-vivo chemical tomography*, **Nature Communications**, 15, 9300, 2024. DOI: 10.1038/s41467-024-53532-7
14. Guiyin Xu, Zheyi Meng, **Yunteng Cao**, Zixu Tao, Qing-Jie Li, Myles Stapelberg, Bing Han, Rui Gao, Qipeng Yu, Meng Gu, Benedetto Marelli, Hailiang Wang, Meifang Zhu, Ju Li, *Burst plasma preparation of metallic nanoparticles on carbon fabrics for antibacterial and electrocatalytic applications*, **NPG Asia Materials**, 16(1), 48, 2024. DOI: 10.1038/s41427-024-00566-4
15. Yilin Zhang, Hui Sun, **Yunteng Cao**, Maxwell J. Kalinowski, Meng Li, Benedetto Marelli, *Directed assembly of*

proteinaceous–polysaccharide nanofibrils to fabricate membranes for emerging contaminant remediation, **ACS Nano**, 18(36), 25205-25215, 2024. DOI: 10.1021/acsnano.4c07409

16. Minghui Shan, Shuchang Xu, **Yunteng Cao**, Bing Han, Xiaoqing Zhu, Tao Zhang, Chenyang Dang, Jiacheng Zhu, Qi Zhou, Zhixin Xue, Yaping Xu, Qixuan Zhu, Md Shariful Islam, Ben Hang Yin, Xijiang Chang, Changyong Cao, Guiyin Xu, Meifang Zhu, *Rapid regeneration of graphite anodes via self-induced microwave plasma*, **Advanced Functional Materials**, 2411834, 2024. DOI: 10.1002/adfm.202411834
17. Yilin Zhang, **Yunteng Cao**, Wenzhi Jiang, Qingquan Ma, Jinwoo Shin, Hui Sun, Jianqiao Cui, Yongsheng Chen, Juan Pablo Giraldo, Michael S. Strano, Gregory V. Lowry, Jen Sheen, Benedetto Marelli, *Polymeric nanocarriers autonomously cross the plant cell wall and enable protein delivery for stress sensing*, **Advanced Materials**, e2409356, 2024. DOI: 10.1002/adma.202409356
18. Yue Hu, **Yunteng Cao**, Franklin M. Nguyen, Bradley D. Frank, Maxwell John Kalinowski, Meng Li, Sarojam Rajani, Benedetto Marelli, *Antibody-targeted phytohormone delivery using foliar sprayed silk fibroin pickering emulsions*, **Advanced Functional Materials**, 2402618, 2024. DOI: 10.1002/adfm.202402618
19. Muchun Liu, **Yunteng Cao**, Zheng Li, Emily Wang, Rajeev J Ram, Benedetto Marelli, *Precise and high throughput delivery of micronutrients in plants enabled by pollen-inspired spiny and biodegradable microcapsules*, **Advanced Materials**, 2401192, 2024. DOI: 10.1002/adma.202401192
20. Guiyin Xu, Minghui Shan, Huijun Chen, **Yunteng Cao**, Ping Nie, Tengfei Xiang, Chenyang Dang, Myles G Stapelberg, Dongyang Zhu, Meifang Zhu, *Recycling of chicken feathers*, **Carbon Neutralization**, 2024. DOI: 10.1002/cnl2.132
21. Yaping Xu, Chenyang Dang, Xiangkun Elvis Cao, **Yunteng Cao**, Jiu Huang, Yuxiang Xu, Minghui Shan, Rui Liu, Peng Li, Guiyin Xu, Meifang Zhu, *Artificial phytoremediation solar interface evaporator for efficient heavy metal salt separation and saline soil remediation*, **Journal of Environmental Chemical Engineering**, 12(4), 113114, 2024. DOI: 10.1016/j.jece.2024.113114
22. Chenyang Dang, Huijie Nie, Xiangkun Elvis Cao, **Yunteng Cao**, Lujia Liu, Xiaoqing Zhu, Qixuan Zhu, Liping Zhu, Guiyin Xu, Meifang Zhu, *System integration for solar-driven interfacial desalination*, **Device**, 2(5), 2024. DOI: 10.1038/s44221-024-00200-1
23. Sonatan Kumar Biswas, Md Shariful Islam, Fei Jia, **Yunteng Cao**, Yanbin Li, Changyong (Chase) Cao, *Flexible Biosensors for Food Pathogen Detection*, **Advanced Electronic Materials**, 2300898, 2024. DOI: 10.1002/aelm.202300898
24. Chenyang Dang, **Yunteng Cao**, Huijie Nie, Wenyuan Lang, Jia Zhang, Guiyin Xu, Meifang Zhu, *Structure integration and architecture of solar-driven interfacial desalination from miniaturization designs to industrial applications*, **Nature Water**, 2, 115–126, 2024. DOI: 10.1038/s44221-024-00200-1
25. Minghui Shan, Chenyang Dang, Kai Meng, **Yunteng Cao**, Xiaoqing Zhu, Jia Zhang, Guiyin Xu, Meifang Zhu, *Recycling of LiFePO4 cathode materials: From laboratory scale to industrial production*, **Materials Today**, 2024. DOI: 10.1016/j.mattod.2023.12.012
26. Zhen Chen, Huigang Wang, **Yunteng Cao**, Yujie Chen, Ozan Akkus, Hezhou Liu, Changyong (Chase) Cao, *Bio-inspired anisotropic hydrogels and their applications in soft actuators and robots*, **Matter**, 2023. DOI: 10.1016/j.matt.2023.08.011
27. Yangyang Han#, Song Wang#, **Yunteng Cao**, Gajendra Pratap Singh, Suh In Loh, Raju Cheerlavancha, Mervin Chun-Yi Ang, Duc Thinh Khong, Patrina Wei Lin Chua, Peiying Ho, Michael Strano, Benedetto Marelli, *Design of biodegradable, climate-specific packaging materials that sense food spoilage and extend shelf life*, **ACS Nano**, 17(9), 8333–8344, 2023. DOI: 10.1021/acsnano.2c12747
28. Chenyang Dang, Hua Wang, **Yunteng Cao**, Jing Shen, Jia Zhang, Letian Lv, Guiyin Xu, Meifang Zhu, *Ultra salt-resistant solar desalination system via large-scale easy- assembly of microstructural units*, **Energy & Environmental Science**, 15, 5405-5414, 2022. DOI: 10.1039/D2EE03341K
29. Augustine T. Zvinavashe, Zeina Barghouti, **Yunteng Cao**, Hui Sun, Doyoon Kim, Muchun Liu, Eugene Lim, Benedetto Marelli, *Degradation of regenerated silk fibroin in soil and marine environments*, **ACS Sustainable Chemistry & Engineering**, 10(34), 11088–11097, 2022. DOI: 10.1021/acssuschemeng.2c00949
30. Hui Sun, **Yunteng Cao**, Doyoon Kim, Benedetto Marelli, *Biomaterials technology for agrofood resilience*, **Advanced Functional Materials**, 2201930, 2022. DOI: 10.1002/adfm.202201930
31. Yaokun Pang, Shoue Chen, **Yunteng Cao**, Zhida Huang, Xianchen Xu, Yuhui Fang, Changyong Cao, *Self-powered multifunctional human–machine interfaces for respiratory monitoring and smart system control*, **Advanced Materials Interfaces**, 2201202, 2022. DOI: 10.1002/admi.202201202
32. Doyoon Kim, **Yunteng Cao**, Dhanushkodi Mariappan, Michael S. Bono Jr., A. John Hart, Benedetto Marelli, *A microneedle technology for sampling and sensing bacteria in the food supply chain*, **Advanced Functional Materials**, 31(1), 2005370, 2021. DOI: 10.1002/adfm.202005370
33. Shoue Chen, Yaokun Pang, **Yunteng Cao**, Xiaobo Tan, Changyong Cao, *Soft robotic manipulation system capable of stiffness variation and dexterous operation for safe human–machine interactions*, **Advanced Materials**

Technologies, 6(5), 2100084, 2021. DOI: 10.1002/admt.202100084

34. Xianchen Xu, Qian Wu, Yaokun Pang, **Yunteng Cao**, Yuhui Fang, Guoliang Huang, Changyong Cao, *Multifunctional metamaterials for energy harvesting and vibration control*, **Advanced Functional Materials**, 2107896, 2021. DOI: 10.1002/adfm.202107896
35. Guiyin Xu, Haibin Jiang, Myles Stapelberg, Jiawei Zhou, Mengyang Liu, Qing-Jie Li, **Yunteng Cao**, Rui Gao, Minggang Cai, Jinliang Qiao, Mitchell S Galanek, Weiwei Fan, Weijiang Xue, Benedetto Marelli, Meifang Zhu, Ju Li, *Self-perpetuating carbon foam microwave plasma conversion of hydrocarbon wastes into useful fuels and chemicals*, **Environmental Science & Technology**, 55(9), 6239-6247, 2021. DOI: 10.1021/acs.est.0c06977
36. Yaokun Pang, **Yunteng Cao**, Masoud Derakhshani, Yuhui Fang, Zhong Lin Wang, Changyong Cao, *Hybrid energy-harvesting systems based on triboelectric nanogenerators*, **Matter**, 4(1), 116-143, 2021. DOI: 10.1016/j.matt.2020.10.018
37. Elisabetta Ruggeri, Doyoon Kim, **Yunteng Cao**, Silvia Fare, Luigi De Nardo, Benedetto Marelli, *A multilayered edible coating to extend produce shelf-life*, **ACS Sustainable Chemistry & Engineering**, 8(38), 14312-14321, 2020. DOI: 10.1021/acssuschemeng.0c03365
38. Yihao Zhou, Changyong Cao, **Yunteng Cao**, Qiwei Han, Charles B.Parker, Jeffrey T.Glass, *Robust and high-performance electrodes via crumpled Au-CNT forests for stretchable supercapacitors*, **Matter**, 2(5), 1307-1323, 2020. DOI: 10.1016/j.matt.2020.02.024
39. Shoue Chen, **Yunteng Cao**, Morteza Sarparast, Hongyan Yuan, Lixin Dong, Xiaobo Tan, Changyong Cao, *Soft crawling robots: design, actuation, and locomotion*, **Advanced Materials Technologies**, 5(2), 1900837, 2020. DOI: 10.1002/admt.201900837
40. Yaokun Pang, **Yunteng Cao**, Yihang Chu, Minghong Liu, Kent Snyder, Devin MacKenzie, Changyong Cao, *Additive manufacturing of batteries*, **Advanced Functional Materials**, 30(1), 1906244, 2020. DOI: 10.1002/adfm.201906244
41. Changyong Cao, Yihao Zhou, Stephen Ubnoske, Jianfeng Zang, **Yunteng Cao**, Philémon Henry, Charles B. Parker, Jeffrey T. Glass, *Highly stretchable supercapacitors via crumpled vertically aligned carbon nanotube forests*, **Advanced Energy Materials**, 9(22), 1900618, 2019. DOI: 10.1002/aenm.201900618
42. Yin Liu, **Yunteng Cao**, Xi-Qiao Feng, Changyong Cao, *Phase transition and optimal actuation of active bilayer structures*, **Extreme Mechanics Letters**, 29, 100467, 2019. DOI: 10.1016/j.eml.2019.100467
43. Zhitao Zhou, Shaoqing Zhang, **Yunteng Cao**, Benedetto Marelli, Xiaoxia Xia, Tiger H Tao, *Engineering the future of silk materials through advanced manufacturing*, **Advanced Materials**, 30(33), 1706983, 2018. DOI: 10.1002/adma.201706983
44. Liangliang Zhu, **Yunteng Cao**, Yilun Liu, Zhe Yang, Xi Chen,*Architectures of soft robotic locomotion enabled by simple mechanical principles*, **Soft Matter**, 13(25), 4441-4456, 2017. DOI: 10.1039/C7SM00636E

Talks & Conferences

Invited Talks

1. **Yunteng Cao**, *Protein-based Biomaterials for Precision Agriculture*, Plant Molecular Biology (PMB) Seminar, Yale University, New Haven, CT, October 2025
2. **Yunteng Cao**, *Silk Microneedles for Precision Agriculture*, Gordon Research Seminar: Silk Proteins and the Transition to Biotechnologies, Smithfield, RI, July 2025
3. **Yunteng Cao**, *Protein-based Biomaterials for Precision Agriculture*, Soft, Fluid, Living Matter (SoFLivMat) Series, Yale University, New Haven, CT, June 2025
4. **Yunteng Cao**, *Integrating Biomaterials and Bioengineering for Precision Agriculture*, School of Environmental, Civil, Agricultural and Mechanical Engineering, The University of Georgia, Athens, GA, February 2025

Selected Oral Presentations

1. **Yunteng Cao**#, Michael Truong-Giang Nguyen#, Michael Grome, Svetlana Rogulina, Jesse Rinehart, Farren Isaacs, *Biomanufacturing Proteins with Expanded Chemistry Using Next-Gen Genomically Recoded Organisms*, 2025 SES Annual Technical Meeting, Atlanta, October 2025
2. **Yunteng Cao**, Doyoon Kim, Benedetto Marelli, *Silk Microneedle-Mediated Drug Delivery and Sensing for Agrofood Systems*, Microneedles 2023: 7th International Conference on Microneedles, Seattle, May 2023
3. **Yunteng Cao**#, Sally Shuxian Koh#, Yangyang Han, Javier Jingheng Tan, Doyoon Kim, Nam-Hai Chua, Daisuke Urano, Benedetto Marelli, *Silk Microneedle-Mediated Drug Delivery in Plants*, ACS Spring 2023, Indianapolis, March 2023
4. **Yunteng Cao**#, Doyoon Kim#, Zheng Li, Federica Rigoldi, Hui Sun, Rajeev Ram, and Benedetto Marelli, *Phase Front Assembly for Mesostructured Design of Biopolymer Microneedles*, 2022 MRS Fall Meeting, Boston, November 2022
5. **Yunteng Cao**#, Sally Shuxian Koh#, Yangyang Han, Javier Jingheng Tan, Doyoon Kim, Nam-Hai Chua, Daisuke Urano, Benedetto Marelli, *Efficient Deployment of Gibberellic Acid in Plants with Minimal Wounding Using*

Silk-Based Microneedles, 2022 MRS Fall Meeting, Boston, November 2022

6. **Yunteng Cao**, Eugene Lim, Menglong Xu, Jing-Ke Weng, Pil Joong Chung, Nam-Hai Chua, Benedetto Marelli, *Precise Payloads Delivery to Multi-tissues of Plants via Microneedles Fabricated from Silk-based Biomaterial*, 2021 MRS Fall Meeting, Boston, November 2021
7. **Yunteng Cao**, Eugene Lim, Menglong Xu, Jing-Ke Weng, Pil Joong Chung, Nam-Hai Chua, Benedetto Marelli, *Precision Delivery of Multi-Scale Payloads to Tissue-Specific Targets in Plants*, ACS Fall 2020 Virtual Meeting & Expo, 2020
8. **Yunteng Cao**, Benedetto Marelli, *Targeted Delivery of Antibiotics in Plants through Silk-based Materials*, MRS Fall Meeting and Exposition, Boston, November 2017
9. **Yunteng Cao**, Youlong Chen, Yilun Liu, Xi Chen. *A Novel Gait and Its Mechanism for Snake-like Soft Robot*, The Chinese Congress of Theoretical and Applied Mechanics (CCTAM 2015), Shanghai, August 2015

Selected Poster Presentations

1. **Yunteng Cao**#, Michael Truong-Giang Nguyen#, Michael Grome, Svetlana Rogulina, Jesse Rinehart, Farren Isaacs, *Biomanufacturing Proteins with Expanded Chemistry Using Next-Gen Genomically Recoded Organisms*, 2025 SES Annual Technical Meeting, Atlanta, October 2025
2. **Yunteng Cao**#, Doyoon Kim# et al., *Enabling High-throughput Micronutrient Delivery and Continuous Sap Monitoring in Plants with Silk Microneedles*, Sussex Plant Biology Symposium, Connecticut Agricultural Experiment Station, New Haven, CT, October 2025
3. **Yunteng Cao**#, Doyoon Kim# et al., *Enabling High-throughput Micronutrient Delivery and Continuous Sap Monitoring in Plants with Silk Microneedles*, Gordon Research Conference: Silk Proteins and the Transition to Biotechnologies, Smithfield, RI, July 2025
4. **Yunteng Cao**#, Michael T. A. Nguyen#, Michael W. Grome, Svetlana Rogulina, Jesse Rinehart, Farren J. Isaacs, *Biomanufacturing proteins with expanded chemistry using next-gen genomically recoded organisms*, Yale Systems Biology Institute Symposium 2025, Yale University, West Haven, June 2025
5. **Yunteng Cao**, Doyoon Kim, Benedetto Marelli, *Silk-Based Microneedles for Drug Delivery and Sensing for Agrofood Systems*, Gordon Research Conference on Silk Proteins and the Transition to Biotechnologies, Bryant University, Smithfield, July 2023
6. **Yunteng Cao**#, Sally Shuxian Koh#, Yangyang Han, Javier Jingheng Tan, Doyoon Kim, Nam-Hai Chua, Daisuke Urano, Benedetto Marelli, *Efficient Deployment of Hormones in Plants with Minimal Wounding Using Silk-Based Microneedles*, 6th International Conference on Plant Synthetic Biology, Bioengineering and Biotechnology, Florida, Dec 2022

Patents

1. Benedetto Marelli, **Yunteng Cao**, *Precision Delivery of Multi-scale Payloads to Tissue-specific Targets in Plants*, Application PCT/US2021/027639, Publication WO2021211942A1, US20230143553A1.
2. Benedetto Marelli, Hui Sun, Doyoon Kim, **Yunteng Cao**, *Fabrication of Polymeric Microneedles with Hollow and Porous Tips via a Simple Micromolding Process Assisted by Ionic Salts*, PCT Patent Application No. PCT/US23/64110, March 10, 2023

Outreach & Professional Development

Outreach

- Presenter, MIT Museum Cambridge Science Festival, Cambridge, MA, 2022
- Presenter, Girls' Science Investigations, 2024

Academic Service

- Organizer, MCDB Postdoc Chalk Talk Observation Program, 2025
- Symposium co-Organizer, Advanced Materials: Design, Processing, Characterization and Applications, 2024 International Mechanical Engineering Congress and Exposition, Portland, OR, 2024
- Symposium Session Chair, Printed Hybrid Multifunctional Electronics and Energy Devices, 2023 International Mechanical Engineering Congress and Exposition, New Orleans, LA, 2023
- Symposium Session Chair, Symposium SF01: Smart Functions of Stimuli-Responsive Materials, MRS Fall 2022 Meeting, Boston, MA, 2022

Reviewer

- *Advanced Functional Materials, Small, Materials Today Physics, Advanced Materials Technologies, Advanced Engineering Materials, IEEE Robotics and Automation Letters (RA-L), Transactions on Mechatronics, Journal of Biomechanics, Communications Engineering, Nano Materials Science*

– *Molecular Plant*

Professional affiliations

– Member, Materials Research Society, 2017-present
– Member, American Chemical Society, 2021-present

Selected media coverage

1. *A new technology for extending the shelf life of produce*, MIT News, by Zach Winn.
2. *Will the vegetables of the future be fortified using tiny needles?*, MIT News, by Zach Winn. Cover Story of MIT News on April 30th, 2025.
3. *Yale scientists recode the genome for programmable synthetic proteins*, Yale News.
4. *A new method to detect dehydration in plants*, MIT News.
5. *Scientists develop method of using microneedles to deliver nutrients directly into plants*, Channel NewsAsia.
6. *A new microneedle-based drug delivery technique for plants*, MIT News.
7. *CEE leads environmental hands-on demonstrations at the Cambridge Science Festival*, MIT CEE News.
8. *Velcro-like food sensor detects spoilage and contamination*, MIT News, by Jennifer Chu.
9. *Silk-based microneedles may help treat diseased plants*, Science News for Students, by Kathryn Hulick.
10. *HLB a Target of MIT Research*, Citrus Industry Magazine.
11. *Drugs Delivered By Patches And Darts Could Help Save Plants Ravaged By Disease: MIT Research*, Forbes, by Jeff Kart.
12. *Device could deliver 'life-saving' treatment to diseased fruit plants*, United Press International (UPI), by Sommer Brokaw.
13. *Engineers develop precision injection system for plants*, MIT News, by David L. Chandler.
14. *For refugee camps, a waterless toilet to improve health and safety*, MIT News, by Kara Baskin.

References

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