

# Yunteng Cao

Laboratory for Advanced Biopolymers  
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## EDUCATION

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- Massachusetts Institute of Technology** Cambridge, MA, USA  
*PhD Candidate, Advisor : Prof. Benedetto Marelli* Sep 2016 - present
- Xi'an Jiaotong University** Xi'an, Shaanxi, China  
*M.Eng. in Solid Mechanics, Advisor : Prof. Xi Chen, Prof. 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. in Engineering Mechanics, Advisor : Prof. Xiaobo Gong* Sep 2009 - Jul 2013  
*Thesis: Numerical Simulation of the Behaviors of a Solid Particle in a Microchannel*

## EXPERIENCE

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- Research Assistant** 09/2016-present  
*Laboratory for Advanced Biopolymers*  
*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**

- Engineered silk based materials specifically for plant application;
- Design, fabrication, and characterization of microneedles loaded with various payloads;
- Payloads delivery to various plant tissues via microneedles;
- Materials sampling via silk based microneedles.

**Sampling and Sensing Bacteria in the Food Supply Chain via microneedles**

- Optimized silk based microneedles for food sampling;
- Optimized sensor performances in response to bacterial contamination.

**Edible coating for food preservation via biopolymers**

- Characterized biopolymers;

- Visiting 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**

- Construction of a system using *E coli* expressing FT-like proteins, extraction and purification of recombinant proteins;
- Delivery of recombinant 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 experimentally the behaviors of specimens under the quasi-static compression and impact;

**A novel slithering locomotion mechanism for snake-like soft robot**

- Studied the slithering locomotion of snakes and the motion of snake in parallel constraints;
- Proposed a novel slithering locomotion mechanism involved in negative Poisson's ratio;
- Carried out FEM simulations to investigate factors such as curvature, Poisson's ratio;
- Manufacturing pneumatic snake-like soft robots.

### **Rational design of 3D architected metamaterial with tunable negative Poisson's ratio by harnessing instability**

- Numerically simulated the deformation behaviors of RVE triggered by instability;
- Investigated the effects of the three approaches proposed to tune the Poisson's ratio;
- Modeled the deformation behavior of structure to predict the Poisson's ratio for further application.

### **Undergraduate Research Internship**

07/2012-08/2012

*Department of Engineering Mechanics, Tsinghua University, China*

(Advisor: Prof. Xiqiao Feng)

### **Mechanical properties and performance of nano-plate with surface stresses**

- Numerical modeling and investigation of Van der Waals interaction induced instability and morphogenesis of circular nano-plate using finite element method

### **Undergraduate Researcher for Participation in Research Project of SJTU**

03/2012-05/2012

*Department of Engineering Mechanics, Shanghai Jiao Tong University, China*

(Advisor: Prof. Chenli Zhang)

### **Mechanical properties and modeling of graphene under simple loading conditions**

## ACTIVITIES

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### **MIT-France Program**

01/2017-01/2017

*Polytech-AMU, Aix-Marseille University*

### **5th Marseille Winter School On Multi-Scale Porous Materials 2017**

### **change:WATER Labs**

12/2016-present

*MIT D-Lab*

### **Developing dignified sanitation to population by developing a compact, evaporative toilet for homes without power or plumbing**

- Won Hult Prize, MIT \$100k, etc and reported by MIT News and many presses such as Phys.org, Boston Globe, and Bloomberg

## PUBLICATIONS

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- Heyu Yin, Yunteng Cao, Benedetto Marelli, Xiangqun Zeng, Andrew J. Mason, Changyong Cao, *Soil Sensors for Smart and Precision Agriculture*, Advanced Materials. Under review after revision.
- Doyoon Kim, Yunteng Cao, Dhanushkodi Mariappan, Michael S. Bono Jr., A. John Hart, and Benedetto Marelli, *A Microneedle Technology for Sampling and Sensing Bacteria in the Food Supply Chain*, Advanced Functional Materials, 2020, 2005370. **Selected as Front Cover**
- Elisabetta Ruggeri, Doyoon Kim, Yunteng Cao, Silvia Fare, Luigi De Nardo, and Benedetto Marelli, *A Multilayered Edible Coating to Extend Produce Shelf-life*, ACS Sustainable Chemistry & Engineering, 2020.
- Yunteng Cao, Eugene Lim, Menglong Xu, Jing-Ke Weng, and Benedetto Marelli, *Precision Delivery of Multiscale Payloads to Tissues Specific Targets in Plants*, Advanced Science, 2020, 1903551. **Selected as Front Cover**
- 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(2020).
- 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, no. 2 (2020): 1900837.
- 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, no. 22 (2019): 1900618.
- Zhitao Zhou, Shaoqing Zhang, Yunteng Cao, Benedetto Marelli, Xiaoxia Xia, Tiger H Tao, *Engineering the Future of Silk Materials through Advanced Manufacturing*, Advanced Materials, 2018, 20 (33) 1706983. **Selected as Back Cover**
- 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 (2017): 304-320.
- Liangliang Zhu, Yunteng Cao, Yilun Liu, Zhe Yang, Xi Chen, *Architectures of Soft Robotic Locomotion Enabled by Simple Mechanical Principles*, Soft Matter 13, No. 25 (2017): 4441-4456.

## CONFERENCES

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1. 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
2. Yunteng Cao, Benedetto Marelli, *Targeted Delivery of Antibiotics in Plants through Silk-based Materials*, MRS Fall Meeting and Exposition, Boston, November 2017
3. 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

## AWARDS

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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 (CSTAM), 2012

## TECHNICAL SKILLS

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**Languages:** Python, Fortran  
**Software:** MATLAB, ABAQUS, Adobe Illustrator  
**Other Skills:** Custom built mechanical and optical experimental setup