

## EDUCATION

---

- Massachusetts Institute of Technology** Cambridge, MA  
Ph.D. in Civil and Environmental Engineering 09/2014 –01/2021
- GPA: 5.0/5.0 (full A/A+)
  - Advisor: Lydia Bourouiba
  - Thesis: “Fundamentals in unsteady fluid fragmentation from drop impact”
- University of Cambridge** Cambridge, UK  
M.A.St in Applied Mathematics (Part III Tripos of Applied Mathematics) 09/2012 –07/2013
- GPA: 3.78/4.00 (79.12/100) **Distinction** (First class) Ranking: 22/115
  - Advisor: Edward J. Brambley
  - Thesis: “The transmission of shock waves in curved tubes”
- University of Hong Kong** Hong Kong  
B.S. in Mechanical Engineering 09/2010 –06/2012
- GPA: 3.9/4.0 **First class honor** Ranking: 3/77
  - Advisor: Kwok Wing Chow
  - Thesis: “Nonlinear shallow water waves on running water”
- Shanghai Jiao Tong University** Shanghai, CN  
B.S. in Mechanical Engineering (dual degree with the University of Hong Kong) 09/2008 –06/2010
- GPA: 3.74/4.0 **Top 10%** Ranking: 6/106

## RESEARCH EXPERIENCE

---

- Princeton University** Princeton, NJ  
Postdoctoral research associate in the *Department of Geosciences* Mentor: Ching-Yao Lai Starting 02/2021
- Massachusetts Institute of Technology** Cambridge, MA  
Ph.D student in the *Civil and Environmental Engineering* Advisor: Lydia Bourouiba
- Fundamentals in unsteady fluid fragmentation on drop impact 09/2015 - 01/2021
  - Innovated fully-automatized integrated platform that enables reproduction of complex fragmentation experiments with high efficiency and accuracy, combined with systematic flow visualization and measurement techniques.
  - Developed multi-step Advanced Image-Processing algorithms to capture spatio-temporal evolution of key physical quantities of unsteady fragmentation with unprecedented accuracy.
  - Established a theoretical framework to elucidate fundamental physics underlying unsteady fragmentation that enables the prediction of both size and speed distributions of droplets generated during fragmentation.
  - Drop-on-drop interactions on rigid surfaces 09/2014 - 01/2016
  - Discovered four types of interactions upon drop impact in the vicinity of another sessile drop on the surface.
  - Rationalized and predicted the boundaries between different types of drop-on-drop interactions.

## Massachusetts Institute of Technology

Cambridge, MA

Head graduate researcher at *change:WATER Labs* (Clean tech. startup)

- Dignified sanitation solutions for non-sewered communities 09/2015 - 06/2018
  - Invented low-price, compact, standalone and dignified non-sewered toilet, made of specific-designed membrane that enables rapidly shrinking of urban sewage accumulations by evaporation.
  - Designed precise and well-controlled fluid dynamics experiments for measuring the evaporation rate of the toilet under different environmental conditions, including humidity, temperature and pressure.
  - Developed advanced data-processing algorithms that enable systematic analysis of measured experimental data for validating and improving toilet performance.
  - Configured the ventilation system and internal structure of the non-sewered toilet based on systematic tests to maximize its efficiency to shrink liquid sewage by evaporation.

## University of Hong Kong

Hong Kong

Research assistant at the *Aerodynamics and Acoustics Laboratory* Advisor: Lixi Huang

- High-order wave propagation and noise attenuation control in cylindrical ducts 07/2013 - 07/2014
  - Innovated sophisticated experimental setups to mimic the fan noise of aircraft engine.
  - Wrote computational program for simulating superposition of acoustic pressure field from point sources with different phase angles and amplitudes at any positions in cylindrical tubes.
  - Introduced new approach of producing rotating sound in a cylindrical tube with single high-order azimuthal mode and designed the duct lining made of micro-perforated panels for high-frequency noise attenuation.

## University of Cambridge

Cambridge, UK

Graduate researcher at the *Waves group* of DAMTP Advisor: Edward J. Brambley

- The transmission of shock waves in curved tubes 12/2012 - 05/2013
  - Researched Whitham's geometrical shock dynamics.
  - Implemented a simple method to derive the geometrical and dynamical relations between the cross-sectional area of the ray tube and the velocity of the shock front.
  - Wrote computational program for simulating the transmission of shock waves in a rectangular tube based on Whitham's geometrical shock dynamics.

## University of Hong Kong

Hong Kong

Undergraduate researcher in the department of *Mechanical Engineering* Advisor: Kwok Wing Chow

- Nonlinear shallow water waves on running water 12/2012 - 05/2013
  - Studied asymptotic expansion and perturbation theory.
  - Mastered the way of deriving the Korteweg-de Vries (KdV) and Kadomtsev-Petviashvili (KP)-type II equations in the case of small-amplitude perturbation and no mean flow.
  - Investigated the problem of uniform flow or shear flow, with focus on the conditions of production of lump solitary wave production at the surface, and its compatibility with the first kind of KP equations.

## TEACHING EXPERIENCE

---

### Massachusetts Institute of Technology

- Teaching Assistant of *Nonlinear Dynamics and Turbulence (1.686/18.358/2.033)* Spring 2017 & 2020
  - Graduate-level course Class size: 10-15 students Twice

- Held and led office hours, tutorials, and graded problem sets.
- Assisted students to understand lecture materials and illustrate problem sets.
- Teaching Assistant of *Fluids and Diseases (1.063/1.631/2.250/HST.537)* Spring 2017 – 2019  
Graduate-level course      Class size: 10-15 students      Three times
- Improved teaching materials including problem sets and their solutions.
- Prepared equipment for in-class demonstration.
- Taught students recitations and lectures on fundamental fluid dynamics.
- Created teaching demonstration GUIs to illustrate how spatial information affects disease transmission.
- Teaching Assistant of *Nonlinear Dynamics: Continuum Systems (1.062/18.354)* Spring 2016 & 2018  
Graduate-level course      Class size: 10-15 students      Twice
- Improved teaching materials including problem sets and their solutions.
- Prepared equipment of the lab session for students to conduct experiments.
- Taught recitations of the course for students to prepare quizzes and mid-term exams.
- Assistant of *Innovation and Technology in Agriculture and the Environment* Summer 2017  
MIT Professional Education Short Program      Class size: 10-15 participants
- Prepared equipment and notes for the laboratory demonstration.

## HONORS AND AWARDS

---

### Individual Awards

- John S. Hennessy OGE Fellowship 2017  
Competitive institutional fellowship (one per year) awarded to graduate students with strong academic and research performance by the Office of Graduate Education, Massachusetts Institute of Technology.
- MIT GSC Travel Grant 2017 & 2019  
Competitive institutional travel grant awarded by the Graduate Student Council, Massachusetts Institute of Technology, in support of travel expenses for graduate students who present talks in academic-related conferences.
- Best Talk Award of MIT CEE Research Speed Dating Event 2017  
The first prize of the graduate student presentation competition at the Research Speed Dating Event hosted by the Department of Civil and Environmental Engineering, Massachusetts Institute of Technology.
- Berger Fellowship 2015  
Honorific fellowship awarded to newly-enrolled graduate students with strong academic and research background by the Department of Civil and Environmental Engineering, Massachusetts Institute of Technology
- Cambridge Darwin College Prize 2013  
Honorific prize awarded to the students in Darwin College who achieve Distinction for their degrees by Darwin College, the University of Cambridge.
- Dean's Honor List of the Faculty of Engineering, HKU 2011 & 2012  
Highest academic prize awarded to the top 5% undergraduate students with the best academic performance by the Faculty of Engineering, the University of Hong Kong.
- CEDES Scholarship 2008-2012

Competitive institutional 4-year scholarship (two per year) awarded to undergraduate students of Shanghai Jiao Tong University with strong academic performance by the CEDES Corporation.

- Merit Student of Shanghai Jiao Tong University 2010  
Highest individual prize awarded to undergraduate students with the best comprehensive qualities including academic, research and social activities by Shanghai Jiao Tong University.
- Top Ten learning pacesetter of the Faculty of Engineering, SJTU 2010  
Highest academic prize awarded to undergraduate students with with the best academic performance by the Faculty of Engineering, Shanghai Jiao Tong University.
- Scholarship of Shanghai Jiao Tong University 2009 & 2010  
Competitive institutional scholarship awarded to the top 10% undergraduate students with the best academic performance by Shanghai Jiao Tong University.
- The Third Prize of Applied Mathematics contest of Shanghai City 2008
- The First Prize of Physics contest of Shanghai City 2008

#### **Team Awards** (*change: WATER Labs*)

- MIT Water Innovation Prize Winner 2017  
The first prize of MIT Water Innovation Competition, a startup competition focused on water innovation, with \$10k grant awarded by the MIT Water Club.
- MIT \$100k Entrepreneurship Competition Audience-Choice-Award 2017  
The third prize of MIT \$100k Entrepreneurship Competition, one of the largest and world famous business plan competitions, with \$10k grant awarded by the MIT Entrepreneurship Center.
- Hult Prize@MIT Winner 2017  
The first prize of Hult Prize Competition at MIT, one of the world famous social entrepreneurship awards.
- Harvard Arab Weekend 5th Start-Up Pitch Competition Winner 2016  
The first prize of Harvard Arab Weekend 5th Start-Up Pitch Competition, with \$10k grant awarded by the Harvard Business School MENA club and the Harvard Arab Alumni Association.
- Tamer Social Impact Fund 2016  
Winner of the seed grants of \$25k to nonprofit, for-profit, and hybrid early-stage social and environmental ventures awarded by Columbia University.
- MIT Enterprise Forum PanArab Innovation for Refugees Competition Winner 2016  
The first prize of a global competition for the best tech-driven solutions addressing the challenges faced by refugees across the globe, with \$10k grant awarded by MIT Enterprise Forum PanArab Innovation for Refugees.
- Mass Clean Energy Council Catalyst Award 2016  
Winner of the seed grants of \$50k to researchers and early-stage companies looking to demonstrate initial prototypes of their clean energy technologies awarded by the Mass Clean Energy Council.
- MIT IDEAS Global Challenge: Grant Winner 2015  
The first prize of the MIT IDEAS Global Challenge competition, an annual innovation and social entrepreneurship competition for MIT students, with \$5K grant awarded by the MIT Innovation Initiative.

## PROFESSIONAL SKILLS

---

### Software and Maker Skills

- Programming languages for scientific analysis: *MATLAB*, *COMSOL*, *Mathematica* and *C++*
- Computer aided design: *AutoCAD*, *SolidWorks* and *UGNX5*

Machining: Sawing, drilling, lathing, milling and computer numerical control (CNC)

Digital control and measurement: *Arduino*, *MATLAB* and *LabView*

### Specific Techniques

- Flow visualization and measurement
  - High-speed Imaging, Schlieren Imaging, Interferometry Particle Imaging, Particle Image Velocimetry.
- Sophisticated equipment design and manufacturing
  - Self-designed super-bright LED panel with liquid-cooling heat sink for maximal lighting for high speed imaging.
  - Vacuum and pressure chamber with temperature and humidity control for varying environmental conditions.
  - Multi-dimensional motorized working platform with automatic control for conducting precise experiments.
  - Feedback-controlled system with image processing technique enabling automatic or remote control of experiments.
- Digital image processing
  - Basic skills: de-noising, de-blurring, image enhancement, object detection, image encoding and compression.
  - Advanced skills: self-developed advanced image processing algorithms that enable detection, tracking and analysis of morphological evolutions of complex fluid phenomena with unprecedented accuracy.
- Particle tracking analysis
  - Self-developed tracking algorithms for various research projects with optimal efficiency and accuracy.
  - Self-developed hybrid algorithms combining Particle Tracking and Image Velocimetries that enable measurement of flow velocity profiles with high spatial resolution from images of high particle seeding density.
- Graphical user interface (GUI) development
  - Self-developed graphical user interfaces for various research projects to optimize the efficiency of data analysis.
  - Self-developed teaching demonstration programs with user-friendly interfaces to illustrate sophisticated concepts for students.

## PRESENTATIONS

---

### Conference Talks

- **Y. Wang** and L. Bourouiba “*Unsteady fragmentation upon drop impact: Sheet dynamics*,” 72th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Seattle, WA (November 2019)
- L. Bourouiba and **Y. Wang** “*Unsteady fragmentation upon drop impact: prediction of droplet size and speed distributions*,” 72th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Seattle, WA (November 2019)

- **Y. Wang** and Bourouiba “*Pathogen transmission via droplets during unsteady fragmentation,*” 1st Fluid and Health Conference, Cargèse, Corsica (August 2019)
- **Y. Wang** and L. Bourouiba “*Ligament dynamics along unsteady rims*”, 71th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Atlanta, GA (November 2018)
- L. Bourouiba and **Y. Wang** “*Rim thickness evolution in unsteady sheet fragmentation,*” 71th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Atlanta, GA (November 2018)
- **Y. Wang** and L. Bourouiba “*Rim destabilization in unsteady sheet expansion in the air from drop impact on small surfaces,*” 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Denver, CO (November 2017)
- L. Bourouiba and **Y. Wang** “*Role of unsteadiness and local dynamics in the selection of secondary droplet sizes in drop impact fragmentation,*” 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Denver, CO (November 2017)
- **Y. Wang** and L. Bourouiba “*Unified thickness profile of radially expanding sheets in the air,*” 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, OR (November 2016)
- L. Bourouiba and **Y. Wang** “*Binary drop interaction on surfaces: onset and bounding ligaments of Crescent-Moon fragmentation,*” 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, OR (November 2016)

### Competition and Pitch Talks

- **Y. Wang**, Conor Smith, Huda Elasaad and Yunteng Cao “*Dignified sanitation solutions for non-sewered communities*” (Third Prize and Audience-Choice Award), MIT \$100k Entrepreneurship Competition, Cambridge, MA (May 2017)
- **Y. Wang**, Conor Smith, Huda Elasaad and Yunteng Cao “*Dignified sanitation solutions for non-sewered communities*” (Finalist), Hultz Prize regional competition, Boston, MA (March 2017)
- **Y. Wang** and L. Bourouiba “*Drop fragmentation in shaping disease transmissions*” (Winner), Research Speed Dating Event, Department of Civil and Environmental Engineering, MIT (February 2017)
- **Y. Wang**, Conor Smith, Huda Elasaad and Yunteng Cao “*Dignified sanitation solutions for non-sewered communities*” (Winner), Hult Prize competition@MIT, Cambridge, MA (November 2016)

### Poster Presentations

- **Y. Wang** and Lydia Bourouiba “*Fundamentals in unsteady fluid fragmentation,*” Research Speed Dating Event, Department of Civil and Environmental Engineering, MIT (February 2020)
- **Y. Wang** and Lydia Bourouiba “*Fundamentals in unsteady fluid fragmentation with applications to disease transmissions,*” Industrial Group Symposium of Institute for Medical Engineering and Science, MIT (October 2019)

### Under Review

1. **Y. Wang** and L. Bourouiba, “Mass, momentum and energy partitioning of unsteady fragmentation”

### Journal Articles

2. **Y. Wang** and L. Bourouiba, “Non-Galilean Taylor-Culick’s law governs sheet dynamics in unsteady fragmentation,” *Journal of Fluid Mechanics*, *accepted* (2021)
3. **Y. Wang** and L. Bourouiba, “Growth and breakup of ligaments in unsteady fragmentation,” *Journal of Fluid Mechanics*, **910**, A39 (2021)
4. **Y. Wang** and L. Bourouiba, “Unsteady sheet fragmentation: droplet sizes and speeds,” *Journal of Fluid Mechanics*, **848**, 946-967 (2018)
5. **Y. Wang**, R. Dandekar, N. Bustos, S. Poulain and L. Bourouiba, “Universal rim thickness in unsteady sheet fragmentation”, *Physical Review Letters*, **120**, 204503 (2018)
6. **Y. Wang** and L. Bourouiba, “Non-isolated drop impacts on surfaces,” *Journal of Fluid Mechanics*, **835**, 24-44 (2018)
7. **Y. Wang** and L. Bourouiba, “Drop impact on small surfaces: thickness and velocity profiles of the expanding sheet in the air,” *Journal of Fluid Mechanics*, **814**, 510-534 (2017)