# Brian Chang

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Google Scholar Profile


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## EDUCATION

**Doctor of Philosophy in Engineering Mechanics**, May 2018
Virginia Polytechnic Institute and State University
*Dissertation*: "Crossing the Air-Water Interface: Inspiration from Nature"
*Advisor*: Dr. Sunghwan "Sunny" Jung

**Bachelor of Science in Engineering Science and Mechanics**, May 2013
Virginia Polytechnic Institute and State University
Minor Mathematics, Cum Laude

## INTERESTS

Bio-inspired fluid mechanics, fluid-structure interactions, water-entry and -exit, interfacial flows and instabilities, impact dynamics, granular physics, high speed imaging, particle image velocimetry, discrete element method.

## APPOINTMENTS

**Postdoctoral Researcher, Complex Matter and Nonlinear Physics Lab** Aug 2020 – present
Department of Physics, Clark University

**Postdoctoral Researcher, Hsieh Lab** Aug 2018 – July 2020
Department of Biology, Temple University

**Fluid Mechanics Adjunct Instructor** Feb 2020 – May 2020
Department of Mechanical Engineering, Temple University

**Graduate Research Assistant, Bio-Inspired Fluid Lab** Aug 2014 – 2018
Department of Biomedical Engineering and Mechanics, Virginia Tech

**NSF EAPSI Fellow, Micro Fluid Mechanics Lab** May – Aug 2017
Seoul National University, Seoul, South Korea

## PUBLICATIONS

**Articles Submitted or in Preparation**

4. Pravin, S., **Chang, B.**, Han, E., London, L., Goldman, D.I., Jaeger, H., & Hsieh, S.T. Intruder distance induces particle jamming during intrusion into granular media. (***Under review***). https://arxiv.org/abs/2010.15172
3. Ahmadi, S.F., Umashankar, V., Dean, Z., **Chang, B.**, Jung, S., & Boreyko, J.B. How multilayered feathers enhance underwater superhydrophobicity. (***Under Review***).
2. **Chang, B.**, Greenwood, A., Nowayti, W., & Hsieh, S.T. Force response of granular materials due to angled intrusions and angled substrates. (***In Prep***).

1. **Chang, B.** & Hsieh, S.T. Footprints in granular media during plate extraction. (***In Prep***).

**Articles in Refereed Publications**

9. Chang, B., Sharma, R., Huyhn, T., & Kudrolli, A. (2020) Aerial mucosalivary droplet dispersal distributions with implications for disease mitigation. *Physical Review Research,* 2 (4), 04339. https://doi.org/10.1103/PhysRevResearch.2.043391

8. Bhar, K*., **Chang, B.***, Virot, E.*, Straker, L., Kang, H., Paris, R., Clanet, C., & Jung, S. (2019) How localized force spreads on elastic contour feathers. *Journal of the Royal Society Interface*, *16*(160), 20190267. https://doi.org/10.1098/rsif.2019.0267

7. **Chang, B.**, Myeong, J., Virot, E., Clanet, C., Kim, H.-Y., & Jung, S. (2019). Jumping dynamics of aquatic animals. *Journal of the Royal Society Interface,* 16: 20190014. https://doi.org/10.1098/rsif.2019.0014.

6. Su, X., **Chang, B.**, Ge, H., and Zhong, L. (2019) A Two-Step Combustion Model of Iso-Octane for 3D CFD Combustion Simulation in SI Engines. *SAE Technical Paper*, 2019-01-0201, 2019, https://doi.org/10.4271/2019-01-0201.

5. Zimmerman, S., Ceballes, S., Taylor, G., **Chang, B.**, Jung, S., & Abdelkefi, A. (2019) Nonlinear modeling and experimental verification of Gannet-inspired beam systems during diving. *Bioinspiration and Biomimetics.* **14,** 026002. http://doi.org/10.1088/1748-3190/aaf98c.

4. Louf, J., **Chang, B.**, Eshraghi, J., Mituniewicz, A., Vlachos, P., & Jung, S. (2018). Cavity ripple dynamics after pinch-off. *Journal of Fluid Mechanics*, 850, 611-623. doi:10.1017/jfm.2018.459.

3. **Chang, B**., Croson, M., Straker, L., Gart, S., Dove, C., Gerwin, J., & Jung, S. (2016). How seabirds plunge-dive without injuries. *Proceedings of the National Academy of Sciences*, 113 (43) 12006-12011, http://doi.org/10.1073/pnas.1608628113.

2. Gart, S., **Chang, B.**, Slama, B., Goodnight, R., Um, S. H., & Jung, S. (2013). Dynamics of squeezing fluids: Clapping wet hands. *Physical Review E*, *88*(2), 023007. http://doi.org/10.1103/PhysRevE.88.023007.

1. **Chang, B.**, Nave, G., & Jung, S. (2012). Drop formation from a wettable nozzle. *Communications in Nonlinear Science and Numerical Simulation*. http://doi.org/10.1016/j.cnsns.2011.08.023.

## PRESENTATIONS/INVITED TALKS

**Chang, B.**, Sharma, R., Huynh, T., & Kudrolli, A. "Mucosalivary droplet clouds and deposition fields from synthetic coughs and sneezes," 2020 APS DFD Meeting, Chicago, IL (Virtual)

**Chang, B.** "The fate of a mucosalivary droplet: lessons from a synthetic sneeze," 2020 Physics Colloquium at Clark University, Worcester, MA.

**Chang, B.**, Greenwood, A., Nowayti, W., & Hsieh, S.T. "Running up a sand dune," 2020 APS March Meeting, Denver, CO.

**Chang, B.**, Greenwood, A., Nowayti, W., & Hsieh, S.T. "Running up a sand dune," 2020 SICB Meeting, Austin, TX.

**Chang, B.** "Running up a Sand Dune," 2019 CST Research Mixer, Temple University, Philadelphia, PA.

**Chang, B.** "Legged Locomotion on Sandy Slopes and Footprints," 2019 Bioinspired Fluid Lab at Cornell University, Ithaca, NY.

**Chang, B.** "Legged Locomotion on Sandy Slopes and Footprints," 2019 Soft Materials Coffee Hour at Princeton University, Princeton, NJ.

**Chang, B.**, and Hsieh, S.T. "Running up a sand dune," 2019 APS March Meeting, Boston, MA.

**Chang, B.**, Myeong, J., Virot, E., Clanet, C., Kim, H.-Y., & Jung, S. "How animals leap out of water," 2019 SICB Meeting, Tampa, FL.

**Chang, B.**, Myeong, J., Virot, E., Clanet, C., Kim, H.-Y., & Jung, S. "How animals leap out of water," 2018 APS Division of Fluid Dynamics, Atlanta, GA.

**Chang, B.**, Myeong, J., Virot, E., Kim, H.-Y., & Jung, S. "Effects of Geometry and Kinematics on Animals Leaping Out of Water," 2017 APS Division of Fluid Dynamics, Denver, CO.

**Chang, B.**, Croson, M., Straker, L., Gart, S., Dove, C., Gerwin, J., & Jung, S. "How seabirds plunge-dive without injuries," 2017 Graduate Student Research Symposium, Blacksburg, VA.

**Chang, B.**, Croson, M., Straker, L., Gart, S., Dove, C., Gerwin, J., & Jung, S. "How seabirds plunge-dive without injuries," 2017 APS March Meeting, New Orleans, LA.

**Chang, B.**, & Kim, H.-Y. "Fabrication of a bio-inspired robotic jumping copepod," 2016 EAPSI Symposium, Seoul, South Korea

**Chang, B.**, Croson, M., Straker, L., Gart, S., Dove, C., Gerwin, J., & Jung, S. "How seabirds plunge-dive without injuries," 2016 Virginia Tech Fall Fluid Mechanics Symposium, Blacksburg, VA

**Chang, B.**, Croson, M., Straker, L., Gart, S., Dove, C., Gerwin, J., & Jung, S. "Diving seabirds: the stability of a diving elastic beam," 2015 APS Division of Fluid Dynamics, Boston, MA.

Mituniewicz, A., **Chang, B**., Croson, M., & Jung, S. "Ripple dynamics of water entry after pinch off," 2015 APS Division of Fluid Dynamics, Boston, MA.

**Chang, B.**, Croson, M., Straker, L., Gart, S., & Jung, S. "The mechanics of diving birds," 2014 AmeriMech: Mechanics in Biology, Blacksburg, VA.

**Chang, B.**, Gart, S., Slama, B., Goodnight, R., Um, S. H., & Jung, S. "Dynamics of Squeezing Fluids: Clapping Wet Hands," 2013 APS March Meeting, Baltimore, MD.

## SCHOLARSHIPS / AWARDS

2017 Department Outstanding PhD Student Award
2017 Graduate Student Research Symposium Bronze Award
2017 Engineering Mechanics Travel Fund
2017 Center for Soft Matter and Biological Science Travel Award
2016 East Asia & Pacific Summer Institutes for U.S. Graduate Students
2016 Graduate Development Research Program Award
2015 Davenport Fellowship
2014 Davenport Fellowship
2013 Langley Aerospace Research Summer Scholar

## TEACHING EXPERIENCE

### Temple University

» Fox Online Teaching Certificate, Fox School of Business
*Earned*: Summer 2020
*Description*: Certification course to empower faculty with the fundamental knowledge and skills needed to succeed in a technology-dependent, online environment. Delivers quality training on common pedagogical, logistical, and technological strategies to teaching online with transferrable skills to asynchronous face-to-face instruction.

» Teaching Online Short Course Certificate, Center of Advancement of Teaching
*Earned*: Spring 2020
*Description:* A series of virtual workshops led by a team of education specialists for designing and delivering online courses, developing better practices for online teaching, and promoting evidence-based teaching practices.

» ENGR 3553 *Mechanics of Fluids, Instructor*
*Semesters taught (enrollment):* Spring 2020 (44)
*Course description:* An introduction to fluid mechanics, including general physical properties of fluids, fluid statics and pressure measurements, kinematics of fluid motion, conservation laws in control volume and differential forms with applications, Bernoulli's equation and irrotational flow, viscous flow in pipes and flow measurements, boundary layer theory, and numerical methods.
*Responsibilities*: Delivered online, asynchronous lectures on fundamental fluid mechanic concepts and assessed student performance to maintain ABET accreditation at Temple University. Utilized flipped-classroom approach with many positive student reviews.

**Virginia Tech**

» ESM 3034 *Fluid Mechanics Laboratory, GTA*
*Semesters taught (enrollment):* Fall 2014 (12), Fall 2015 (15), Fall 2016 (N/A)
*Course description:* An introduction to experimental fluid mechanics. Labs include flow measurement and visualization techniques, dimensional analysis, hydrostatic forces on submerged surfaces, drag measurements, channel flow, and concepts in impulse-momentum principle. Use of modern data acquisition techniques and state-of-the-art 6'x6' wind tunnel.
*Responsibilities:* Gave short introductory lectures on fundamental fluid mechanic concepts before each lab session. Trained new TAs on conducting and troubleshooting experiments. Helped to restructure the curriculum in Fall 2016 by redesigning experiments and creating instructional videos for a flipped-classroom. These videos included an introduction to the fluid mechanic principle at hand and instructions on conducting lab experiments.

» ESM 3444 *Mechanics Lab, GTA*
*Semesters taught (enrollment):* Spring 2015 (14)
*Course description:* Introduction to instrumentation. Lectures and labs involving data analysis (uncertainty, error, and statistical concepts) and circuits (wheatstone bridges, operational amplifiers, and transistors). Principles of data aquisition were taught. Final design project is to design a closed loop control system.
*Responsibilities:* Gave short introductory lectures about instrumentation and fundamental circuitry. Troubleshooting circuits and codes, and graded lab reports. Mentored students on their final design projects.

» ESM 4015 *Senior Design Laboratory, GTA*
*Semesters taught (enrollment):* Spring 2018 (*34*), Spring 2017 (45), Spring 2016 (34)
*Course description:* Design of engineering systems and projects encompassing the principles and practices of engineering science and of the several engineering fields. Investigation and report on a supervised design project.
*Responsibilities:* Helped to set up the premier BEAM senior design lab space. Managed scheduling and equipment. Graded lab notebooks, presentations, and reports. Mentored students on experiments.

## CO-ADVISING OF STUDENT RESEARCH

*Co-author. G – Graduate (1), UG – Undergraduate (12), I – Intern (3), HS – High School (1)

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|---|---|
| 21. Ram Sharma, Clark University, G | Physics of Disease Transmission |
| 20. Liana Shpani, Clark University, UG | Physics of Disease Transmission |
| 19. Jade Consalvi, Clark University, UG | Physics of Disease Transmission |
| 18. Anton Deti, Clark University, UG | Physics of Disease Transmission |
| 17. Trinh Huynh, Clark University, UG | Physics of Disease Transmission |
| 16. Alexander Greenwood*, Temple University, UG | Impact of sand dunes |
| 15. Catalina Mantilla*, Temple University, G | DEM foot impact |
| 14. Waleed Nowayti, Temple University, UG | Impact on sand dunes |
| 13. Sarah Xi, Temple University, HS | Physics of foot prints |
| 12. Kinjal Bhar*, Virginia Tech, I | Feather spreading forces |
| 11. Garrett Bimstefer, Virginia Tech, UG | Water jumping robot |
| 10. Jessie Johnson, Virginia Tech, UG | Water jumping robot |
| 9. Romain Paris*, Virginia Tech/Ecole Polytechnique, I | Feather spreading forces |
| 8. Pranav Shukla, Virginia Tech, I | Flapping propulsion robot |
| 7. Michael Valosin, Virginia Tech, UG | Flapping propulsion robot |
| 6. Justin Howell, Virginia Tech, UG | Projectile inspired by plunge-diving bird |
| 5. Giselle Villar, Virginia Tech, UG | Projectile inspired by plunge-diving bird |
| 4. Harris Iqbal, Virginia Tech, UG | Projectile inspired by plunge-diving bird |
| 3. Austin Mituniewicz*, Virginia Tech, UG | Air-cavity ripple dynamics |
| 2. Andrew Marino, Virginia Tech, UG | Morphology of plunge-diving birds |
| 1. Matt Croson*, Virginia Tech, UG | Neck stability in plunge-diving birds |

## INDUSTRY EXPERIENCE

**Fiat Chrysler Automobiles, Powertrain Intern** May – Aug 2015

*Chrysler Tech Center, Auburn Hills, MI*

Developed a two-step combustion model for SI engine reducing computation time by 60% with errors less than 7%.

**Fiat Chrysler Automobiles, Powertrain Intern** May – Aug 2014

*Chrysler Tech Center, Auburn Hills, MI*

Benchmarked fluid flow through a cooling circuit using variety of commercial CFD softwares by correlating data across various regions under different thermostat openings.

**NASA LaRC, Flow Physics Intern** May – Aug 2013

Langley Research Center, Hampton, VA

Explored the use of sweeping jet actuators as a candidate for minimizing flow separation using hydrogen bubble and ink dyes as visualization.

## SERVICE & OUTREACH

» Reviewer for Royal Society Interface

» Session chair at SICB 2019, 2020

» Graduate Engineering Mechanics Society (2017-2018)
Organized events to help the Engineering Mechanics program gain more public visibility.

» Blue Ridge Highlands Regional Science Fair Judge (2017)
Judged K-12 Science Fair entries from the southwest Virginia region.

» Kids' Tech University Volunteer (2016-2018)
Organized booths exhibiting various mechanics phenomena and biomechanics research.

» Virginia Tech String Project (2009-2015)
Taught music and violin to local K-12 students.

» Society of Engineering Science *President* (2013-2014)
Revived the Virginia Tech chapter of SES aimed to provide professional services and networking opportunities to undergraduate students in the Engineering Science and Mechanics program.

» Society of Asian Scientists and Engineers *Fundraising and Outreach Officer* (2012-2013)
Wrote proposals and organized events to raise funds for organization. Raised over $1200 in funding to support activities.

## PROFESSIONAL ORGANIZATIONS

American Physical Society (APS)
Society of Integrative and Comparative Biology (SICB)

## REFERENCES

Dr. Arshad Kudrolli
Professor
Clark University
Postdoc Advisor
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Dr. Tonia Hsieh
Associate Professor
Temple University
Postdoc Advisor
sthsieh@temple.edu

Dr. Sunghwan Jung
Associate Professor
Cornell University
PhD Advisor
sunnyjsh@cornell.edu

Dr. Ho-Young Kim
Professor
Seoul National University
EAPSI Host Scientist
hyk@snu.ac.kr

Dr. Kurosh Darvish
Professor
Temple University
ME Department Chair
kdarvish@temple.edu

Dr. Jonathan Boreyko
Assistant Professor
Virginia Tech
Collaborator/Mentor
boreyko@vt.edu