

# Eric Chang

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## EDUCATION

**Stanford University**, Stanford, CA

Ph.D., Mechanical Engineering, expected Sept. 2020, GPA: 3.83

M.S., Mechanical Engineering, 2017, GPA: 3.74

**Arizona State University**, Tempe, AZ

B.S., Mechanical Engineering, 2015, GPA: 3.96

## SKILLS

**Aerial Robotics** – design, modeling, and fabrication of novel winged small aircraft configurations. Aerodynamics (AVL, XFLR5), propulsion (XROTOR), actuation, autopilots, flight test operations (FAA Part 107 certified)

**Prototyping/Mechanics** – fabrication (CAD/CAM, 3D printing, laser cutting, CNC machining), electronics (PCB design, soldering, microcontrollers), actuators, mechanisms

**Software** – MATLAB, Solidworks, Python, C++, LabVIEW

**Experimental Setups** – rapid 8020 design, motion capture (Vicon, Qualisys), instrumentation (3D anemometers, microphones, imaging, load cells, DAQs), high speed video (Phantom), motion control, wind tunnels

**Documentation/Presentation** – photography, videography, lighting, Adobe (Illustrator, Lightroom, InDesign, Premiere Pro)

**Languages** – Mandarin Chinese (limited working proficiency), Spanish (limited working proficiency)

## EXPERIENCE

**Ph.D. Candidate, Bio-Inspired Research & Design (BIRD) Lab, Stanford University**

2015-present

Developing avian-inspired flying robots to study how birds use wing and tail morphing for flight control. Advisor: David Lentink

- Designed and flight tested a biohybrid feathered morphing wing robot that underactuates the motion of 40 wing feathers and a vertical tailless biohybrid feathered morphing tail robot with 4 active degrees of freedom
- Designing a peregrine falcon-inspired robot for high speed and supermaneuverability

**Intern, Global Supply Management Substrates & Assembly, Intel Corporation**

2014, 2015

Two summer internships collaborating with international suppliers to design CPU substrates assembly equipment

**Undergraduate Researcher, Biomechanics Lab, Arizona State University**

2011-2016

Developed contactless proprioception system for anthropomorphic robotic hand and conducted human grasp study on object handovers. Advisor: Veronica Santos

**Intern, Mechanical Engineering, Ventana Medical Systems**

2013

Developed a system for detecting clogs in a robotic syringe pump used in a tissue staining robot

**Mechanics Engineering Intern, Engineering Science Analysis Corp**

2012-2014

Conducted prototype design, fabrication, testing, performance analysis, and engineering documentation for a nonlethal diver ensnaring device from Technology Readiness Level 5 to 9

**Intern, NASA Dryden Flight Research Center**

2010

Modeled and flight-tested performance of Dryden Remotely Operated Integrated Drone (DROID)

## ACTIVITIES/OUTREACH

**Creativity in Research Scholar, Hasso Plattner Institute of Design at Stanford (d.school)** (2019) – Designing tools to aid academic researchers in communicating their work via photo and video

**President/Project Manager, Air Devils Aeronautics** (2011-2015) – Lead a team to compete an unmanned aerial system in the yearly AIAA Design Build Fly competition. Ranked 17<sup>th</sup> of 100 teams

**Sound Engineer, Peninsula Bible Church** (2016-Present) – Mix front of house and monitors for weekly services and other special events

**Mentor, FIRST Robotics Competition, Corona del Sol HS, McClintock HS, Singapore American School Robotics Teams** (2007-2013) - Taught high school students engineering & teamwork skills to design, fabricate, and compete a 120lb robot

## **PUBLICATIONS**

### **Archival Journal Articles**

Matloff, L. Y., **Chang, E.**, Feo, T. J., Jeffries, L., Stowers, A. K., Thomson, C., and Lentink, D. (2020). How flight feathers stick together to form a continuous morphing wing. *Science*, 367(6475), 293–297.

**Chang, E.**, Matloff, L. Y., Stowers, A. K., and Lentink, D. (2020). Soft biohybrid morphing wings with feathers underactuated by wrist and finger motion. *Science Robotics*, 5(38). *Selected for cover*

Quinn, D., Kress, D., **Chang, E.**, Stein, A., Wegrzynski, M., and Lentink, D. (2019). How lovebirds maneuver through lateral gusts with minimal visual information. *Proceedings of the National Academy of Sciences*, 116 (30) 15033-15041

Hellman, R.B., **Chang, E.**, Tanner, J., Helms Tillery, S.I., and Santos, V.J., "A robot hand testbed for enhancing embodiment and functional neurorehabilitation of body schema in upper limb impairment or loss." *Frontiers in Human Neuroscience*, 9 (26), 1-10.

### **Refereed Conference Proceedings Abstracts**

Chang, E. and Lentink, D. "Biohybrid morphing tail aerial robot." 9<sup>th</sup> International Symposium on Adaptive Motion of Animals and Machines (AMAM 2019), Lausanne, Switzerland, Aug. 20-23, 2019.

Hellman, R.B., **Chang, E.**, Tanner, J., Helms Tillery, S.I., and Santos, V.J., "A robot hand testbed for enhancing embodiment and functional neurorehabilitation of body scheme in upper limb amputees." *Myoelectric Controls Symposium*, New Brunswick, Canada, Aug. 18-22, 2014.

Hellman, R.B., **Chang, E.**, and Santos, V.J. "Tendon-driven testbed for haptic exploration and sensory event-driven grasp and manipulation." *IEEE Haptics Symposium*, Houston, TX, Feb. 23-26, 2014, *Hardware demonstration D78*.

### **Non-refereed Conference Proceedings Abstracts**

**Chang, E.** and Lentink, D. "A Bio-hybrid Morphing Tail for Vertical Tailless Gliding Flight" *Society of Integrative & Comparative Biology Annual Meeting*, Tampa, FL, Jan. 3, 2019.

**Chang, E.**, Matloff, L. Y., Stowers, A. K., and Lentink, D. "Feathered wings: how underactuated wings morph to widen the performance envelope of gliding flight" *Society of Integrative & Comparative Biology Annual Meeting*, San Francisco, CA, Jan. 3, 2018.

**Chang, E.** and Lentink, D. "How Pigeon-inspired Morphed Wings Affect Glide Performance in Turbulence." *Society of Integrative & Comparative Biology Annual Meeting*, New Orleans, LA, Jan. 5, 2017.

Hellman, R.B., **Chang, E.**, Tanner, J., Helms Tillery, S.I., and Santos, V.J. "Tendon-driven testbed for haptic exploration and sensory event-driven grasp and manipulation." *DARPA MTO Sensorimotor Prosthetics Workshop*, Scottsdale, AZ, Feb. 13, 2014.

Hellman, R.B., **Chang, E.**, and Santos, V.J. "Tendon-driven testbed for haptic exploration and sensory event-driven grasp and manipulation." *Piper Health Solutions Workshop on Rehabilitation Robotics*, Tempe, AZ, Feb. 28 - Mar. 1, 2014.

## **MEDIA**

**NPR, National Geographic, Scientific American, Popular Science, The Colbert Report, and others**, 2019-2020, Featured in many news articles, magazine articles, and videos for my work in developing PigeonBot during my PhD.

**Stanford News**, 2018, Featured in article and video titled 'Stanford undergraduates learn to make delivery drones' for my involvement in teaching an aerial robot design course at Stanford University.

**Instructables**, 2014, Featured on the front page of Instructables for a "Recycled Motherboard RC Quadcopter" resulting in over 56,000 views.

**Hackaday Weblog**, 2014, Featured in an article titled "Quadcopter Built From Recycled Motherboards".

**NASA Dryden News & Features**, 2010, Featured in article titled "NASA Dryden's INSPIRE Interns Learn Flight Testing First-hand"

**Robot Magazine**, 2008, Project featured in "Leading Edge Robotics News" for runner up entry in the Grant Imahara VEXplorer Robot Challenge