# Arthur K. MacKeith
# Curriculum Vitae

Contact information and digital portfolio at `Arthur.Mackeith.info`

## EDUCATION

*Ph.D., Mechanical Engineering and Materials Science, Yale University*　　　2021 to Present

Integrated Graduate Program in Physical and Engineering Biology
Advisor: Professor Corey S O'Hern
Research Topics:
Modeling mesophyll (leaf) tissue during development, image analysis of computed tomography (CT) scans of leaf tissue
Selected Course Work:
>   Biological Physics, Statistical Physics I and II, Modeling Leaf Development (research course), Methods and Logic in Interdisciplinary Research, Biomedical Image Processing and Analysis

*M.S., Computer Science, The University of Chicago*　　　June 2020

Cumulative GPA: 3.69/4.00,
Selected Course Work:
>   Algorithms, Math Foundations of Machine Learning, Introduction to Machine Learning, Computer Architecture, Parallel Programming, Time Series Analysis and Stochastic Processes

*B.A., Physics, The University of Chicago*　　　June 2020

Joint degree with M.S.
Cumulative GPA: 3.69/4.00,
Dean's List (2016-2019)

## AWARDS AND FUNDING

>   National Institutes of Health Biophysics Training Grant Program Trainee (September 2022 to Present)
>   James Franck Institute Summer Research Fellowship (2018)

## PUBLICATIONS AND PRESENTATIONS

**Journal Articles:**

Won-Kyu Lee, Daniel J. Preston, Markus P. Nemitz, Amit Nagarkar, **Arthur K. MacKeith**, Benjamin Gorissen, Nikolas Vasios, Vanessa Sanchez, Katia Bertoldi, L. Mahadevan, and George M. Whitesides. A Buckling-Sheet Ring Oscillator for Autonomous Locomotion. *Science Robotics*, 7 https://doi.org/10.1126/scirobotics.abg5812.

Kieran A. Murphy, **Arthur K. MacKeith**, Leah K. Roth, and Heinrich M. Jaeger, (2019), The intertwined roles of particle shape and surface roughness in controlling the shear strength of a granular material. *Granular Matter*, 21. https://doi.org/10.1007/s10035-019-0913-7.

**Poster Presentations:**

**Arthur K. MacKeith**, Kieran A. Murphy, and Heinrich M. Jaeger. 2019. Structure in Cylindrical Packings of Convex Particles. *University of Chicago Undergraduate Research Symposium*.

**Arthur K. MacKeith**, Won-Kyu Lee, George M. Whitesides. 2019. Beam-Climbing Robot Controlled by a Soft Ring Oscillator. *Harvard University Campus Wide Poster Session*.

## RESEARCH EXPERIENCE

*Robotic Intelligence through Perception Lab, Toyota Technological Institute at Chicago, Chicago IL*

Research Engineer                                                                 August 2019 to June 2021

- Explored multidimensional design and control spaces for soft robots with Sofa Framework simulation (finite element method (FEM) software)

- Built interface between reinforcement learning algorithms and Sofa Framework

- Optimized FEM soft robot model for simulation speed and machine learning

- Integrated a low-cost drone into education, and research robotics platform Duckietown. These drones are currently being used in public high schools across Rhode Island for hands on STEM education

*George M. Whitesides Group, Harvard University, Cambridge MA*

REU Student                                                                       June 2019 to August 2019

- Designed and built a low-cost semi-soft beam climbing robot, incorporating soft controls such that it only requires a single constant input pressure gas source to climb

- Exploited static asymmetric friction to produce climbing from contracting actuators and optimized the asymmetry such that the robot was able to climb with a payload equal to its own weight (70 g)

- Designed a pneumatic signal processing demonstration and characterized it using Matlab

*Jaeger Lab, The University of Chicago, Chicago IL*

Research Assistant                                                               December 2017 to June 2019

- Wrote and optimized image analysis python program that fit the position and orientation of the several thousand particles in a granular sample with 99.5% success rate

- Analyzed position and orientation data in python for global trends and mesoscale structures

- Designed 3D particles to print that break predictably to detect shifts in packing structure

- Recorded and reconstructed computed tomography scans of packings of granular media

OUTREACH

*Physics with a Bang! Holiday Lecture and Open House, 2018 - Volunteer Tour Guide*

*Duckietown Robotics Teaching Platform (Mentioned above in Research Experience) - Developer*

SKILLS

– Proficient Languages: Python, C++, Matlab

– Languages with some experience: C, Go, DrRacket (LISP), MIPS Assembly Language

– Tools and Operating Systems: ROS, Docker, Sofa Framework (Finite element method software), Solidworks (some experience), Swig (C and C++ wrapper for Python and other languages), Ubuntu, OSX

– Hardware: 3D printing, Silicon molding, Soldering, Woodworking, Instron