The dynamics of drop impact on soft surfaces has drawn a lot of attention for its application, and an analogous natural example is when a raindrop impacts on a leaf. In nature, a leaf deforms and vibrates a lot when a drop impacts at high speeds (2~10 m/s).

Our group proposes to develop and explore engineering devices inspired by (1) a natural system in which an elastic leaf interacts with an impacting raindrop. Pedagogically, this study will enable us to understand the fundamental mechanism of how an impulsive fluid drop couples with and drives a beam’s bending. Here, we suggest three innovative suitably engineered systems inspired by natural mechanism of elastic beams coupled with fluid drops. An underlying strategy is to use a piezo-electric material for the elastic beam, and then an electric output is recorded and stored due to mechanical vibrations subject to drop impact. This leads to (2) an innovative energy-harvesting device from raindrops. Moreover, by measuring and analyzing the electric signal, we can infer the size, speed, and other hydrodynamic properties of impacting drops or jets.

We want students with some experience in an undergraduate fluid lab course, and basic Matlab coding. Students will learn skills of Matlab image processing, signal processing, and high-speed videography.

Developing Raindrop energy harvesters

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For BEE MEng students;

First of all, you should register

MEng project courses (BEE 5951 Fall/BEE 5952 Spring)

Then, please consider to take these courses:

BEE courses:
BEE 3310 - Bio-Fluid Mechanics
BEE 4500 - Bioinstrumentation
BEE 4570 - Biorobotics

Other recommended courses:
MAE 5650 - Biofluid Mechanics
MAE 5230 - Intermediate Fluid Dynamics with CFD
MAE 4650 - Biofluid Mechanics
MAE 4651 - Biofluid Mechanics
MAE 4272 - Fluids/Heat Transfer Laboratory
MAE 6270 - Experimental Methods in Fluid Dynamics