Abstract Submitted
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**Fast Motion of Plants through mechanical instability: Mechanics without Muscles**[1] QIAOHANG GUO[2], College of Materials Science and Engineering, Fuzhou University; FuJian University of Technology, Fuzhou, China, ZI CHEN, Biomedical Engineering, Washington University in St. Louis, HUANG ZHENG, Fujian Radio and Television University, Fuzhou, China, WENZHE CHEN, Fuzhou University, FuJian University of Technology, Fuzhou, China — Plants are not well known for fast motions, yet some plants such as the Venus flytrap can move in a fraction of a second to capture insects, even though they do not have nerves or muscles. This type of rapid motion has intrigued scientists for centuries. Darwin did a first systematic study on the trap closure mechanism, and considered the plant as "one of the most wonderful in the world". Thereafter, several physical mechanisms have been proposed, such as the rapid loss of turgor pressure, an irreversible acid-induced wall loosening mechanism, and the snap-through model by mechanical instability, but with no unanimous agreement among researchers. Here we propose a coupled mechanical bistable mechanism that explains the rapid closure of the Venus flytrap in a comprehensive manner, consistent with a series of experimental observations. Such bistabile behaviors are theoretically modeled and validated with tabletop experiments. Based on the principles learnt from the Venus flytrap, we are also able to manufacture a preliminary "flytrap robot". Hence, it is promising to design smart bio-mimetic materials and devices with snapping mechanisms as sensors, actuators, artificial muscles and biomedical devices.

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