Abstract Submitted
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Mechanics without Muscles: Fast Motion of the Venus flytrap and Bio-inspired Robotics[1] ZI CHEN, Washington University in St. Louis, QIAOHANG GUO, Washington University, HUANG ZHENG, Fujian Radio and Television University, WEI LI, Fuzhou University, YITING DING, Tsinghua University, GUIPING SU, JUNJIE LIN, Fujian Institute of Technology, YUXIN LIU, Wuhan Foreign Languages School, WENZHE CHEN, Fujian Institute of Technology, LARRY TABER, Washington University — The rapid motion of plants has intrigued scientists for centuries. Plants have neither nerves nor muscles, yet the Venus flytrap can move in a fraction of a second to capture insects. Darwin did a first systematic study on the trap closure mechanism, and called this plant "one of the most wonderful in the world". Several physical mechanisms have since been proposed, such as the rapid loss of turgor pressure, an irreversible acid-induced wall loosening mechanism, and tsnap-through instability, but no unanimous agreement is reached. We propose a coupled mechanical bistable mechanism that explains the rapid closure of the Venus flytrap, consistent with experimental observations. Such bistable behaviors are theoretically modeled and validated with experiments. Biomimetic flytrap robots are also fabricated according to the learnt principles. It is thus promising to design smart bio-mimetic materials and devices with snapping mechanisms as sensors, actuators, artificial muscles and biomedical devices.

[1]Zi Chen and Qiaohang Guo contributed equally. We thank National Science Foundation of China (No. 11102040), American Academy of Mechanics Founder's Award and Society in Science-Branco Weiss fellowship.

Zi Chen
Washington University in St. Louis

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