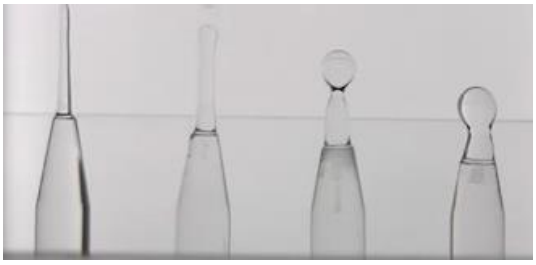
CAPILLARY FLOW CHALLENGE

https://spaceflightsystems.grc.nasa.gov/cfc/

www.asgsr.org www.nasa.gov

WHAT? Teams of grade 9-12 students are challenged to design and build a simple device to eject droplets as far as possible as the device falls down NASA's 2.2 Second Drop Tower. Selected teams will compete in the challenge and are encouraged to present their results to microgravity researchers at a conference in Cleveland, Ohio on Sat., October 29, 2016.

Teams are only responsible for their capillary device (e.g., see the image to the right), where NASA will provide the rest of the experimental hardware. This challenge is designed to be simple, giving teams the chance to change their design based on early results. Although teams are welcome to come to the NASA Glenn Research Center (in Cleveland, OH) to watch their microgravity tests, that is optional and the results will be provided electronically.



Examples of capillary action in microgravity.

The microgravity ejection of the droplets through capillary action is explained in a video at YouTube on *Spontaneous Capillarity-Driven Droplet Ejection*. After developing their concept(s), the teens prepare their proposal consisting of conceptual drawing(s) and a short entry form, which are e-mailed to celere@lists.nasa.gov. If selected, the youth build their unique capillary device based on information provided on the challenge website (see above). The device is then sent to NASA where it will fall 24 meters (79 feet) and experiences 2.2 seconds of apparent near weightlessness, i.e., microgravity. Video results are provided for student analysis and reporting.

WHO? The design challenge is for students in grades 9-12, where teams will be favored over individuals in selection. Youth are free to get help from adults, for example in building their experiment hardware. It is anticipated that about ten proposals will be selected from teams local to NASA Glenn (e.g., within a few hour drive) and about ten proposals will be selected from non-local teams. An organization (e.g., school, science center, 4H club, Scout troop) may submit no more than five proposals, where it is envisioned that no more than two will be selected from a single organization.

WHEN? Proposals can be submitted at any time up to October 1, but selections will be made on an ongoing basis so the odds of acceptance will diminish with time, where it is possible that all selections may be made before Oct. 1. Teams are encouraged to check the challenge website or e-mail celere@lists.nasa.gov to check on the selection status. The testing will be conducted intermittently from August through mid-October, where the student-built experiment hardware should be sent to NASA when ready but must arrive at NASA by no later than Friday, October 7. Experiments will be conducted during the next available drop opportunity following their arrival at NASA.

WHERE? The drops will be conducted at the NASA Glenn Research Center in Cleveland, Ohio. Teams can interact with the challenge coordinator by e-mail and may also visit the test facility, although not at the time of the conference. Furthermore, visits are strictly limited to U.S. citizens and permanent residents with appropriate documentation.

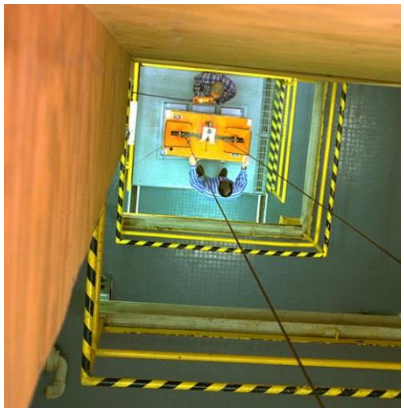
CONFERENCE? Participating teams are strongly encouraged to prepare and present a poster about their research in a student session at the meeting of the American Society for Gravitational and Space Research (ASGSR) in Cleveland, OH on Sat., October 29, 2016. Awards will be presented to teams on that day based on the posters and success with the challenge. Some travel support will be made available to non-local teams who present their results at the meeting.

WHY? The design challenge enables students to learn about experiment design and construction and to participate in research related to space station science, both of which can inspire the pursuit of STEM careers. And selection in a nation-wide NASA challenge is an accomplishment worth noting on college applications!

Astronaut Sunita Williams conducting the Capillary Flow Experiment (CFE) on the International Space Station.

CAPILLARY FLOW? Capillary action occurs when liquid molecules are more attracted to a solid surface than to each other. In paper towels, the water molecules move along tiny fibers within the paper. In plants (like celery), the water moves upward through narrow tubes called capillaries. Capillary action occurs on Earth, but can be difficult to observe - except with small capillaries - because of the overpowering force of gravity. But when experiments fall in a drop tower, capillary effects are easy to see and study! And capillary flow in microgravity is particularly important to NASA as explained at YouTube in a silent video called *Capillary Flow Experiments on Space Station*.

DROP TOWER? While falling down NASA's 2.2 Second Drop Tower (shown on the right), an experiment behaves as if gravity has nearly vanished! Our sensation of gravity and weight comes from a resistance to its pull, for example because of the floor holding us to keep us from falling. If we are freely falling (e.g. after jumping off a diving board), we feel weightless and that is the basis for many amusement park rides. This works because all objects fall at the same acceleration unless acted upon by another force. As one result, the astronauts and the ISS fall together (around the Earth) such that the astronauts float within the space station. This happens even though the space station is so close to the Earth that the gravity is only about 10% less than that on the Earth's surface.



QUESTIONS? Check the challenge website or send an e-mail to **celere@lists.nasa.gov**.

www.nasa.gov **https://spaceflightsystems.grc.nasa.gov/cfc/**