Let us blow

Wrap-Up presentation

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Experiment in zero gravity

- The time spent for astronaut to move to the same position

Aperture/times	3cm	1cm	0.5cm
1	**x**	**18sec**	**40sec**
2	**42sec**	**20sec**	**45sec**

Expected movements

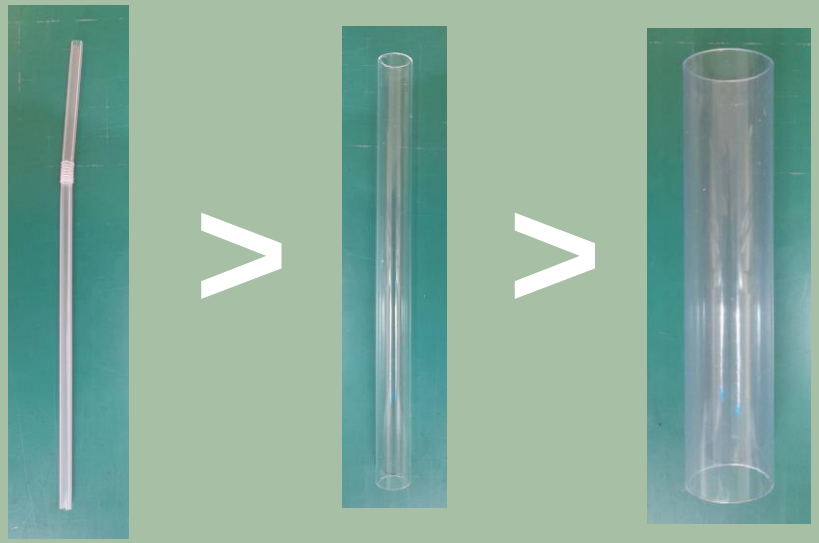
Q=AV

Experimental results

When using a pipe with a smaller aperture, the person will rotate in the opposite direction more noticeably.

Visibility of rotation

5mm straw > **1cm pipe** > **3cm pipe**



Rotation is not noticeable while using the pipe with the smallest aperture.

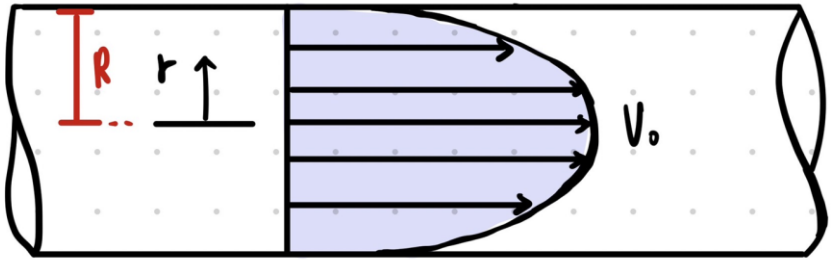
Visibility of rotation

1cm pipe > **3cm pipe** > **5mm straw**

Speculated reasons

Laminar flow

- **Condition:**
- The pressure of the gas blown out by astronauts is consistent each time
- The flow velocity profile follows a parabolic distribution

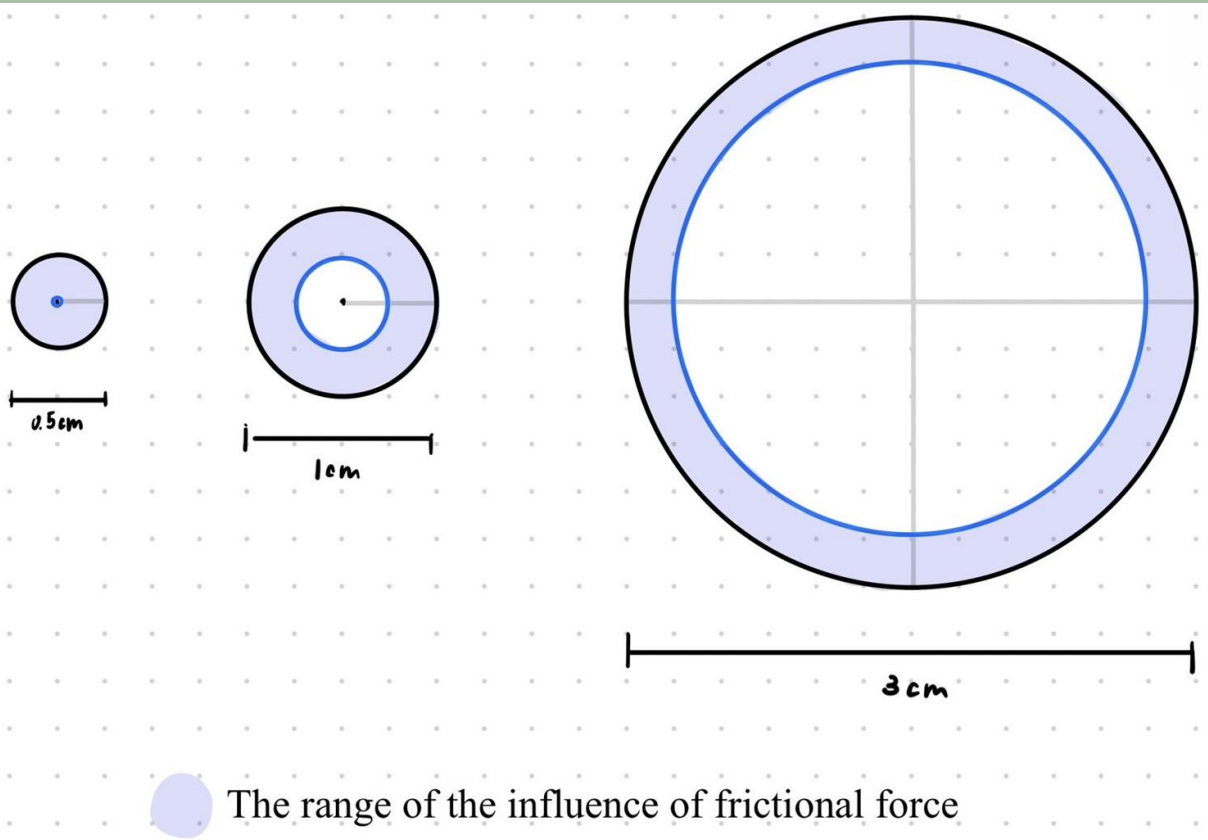


The flow velocity proflie

The gas flow is fastest at the center of the pipe(r=0)

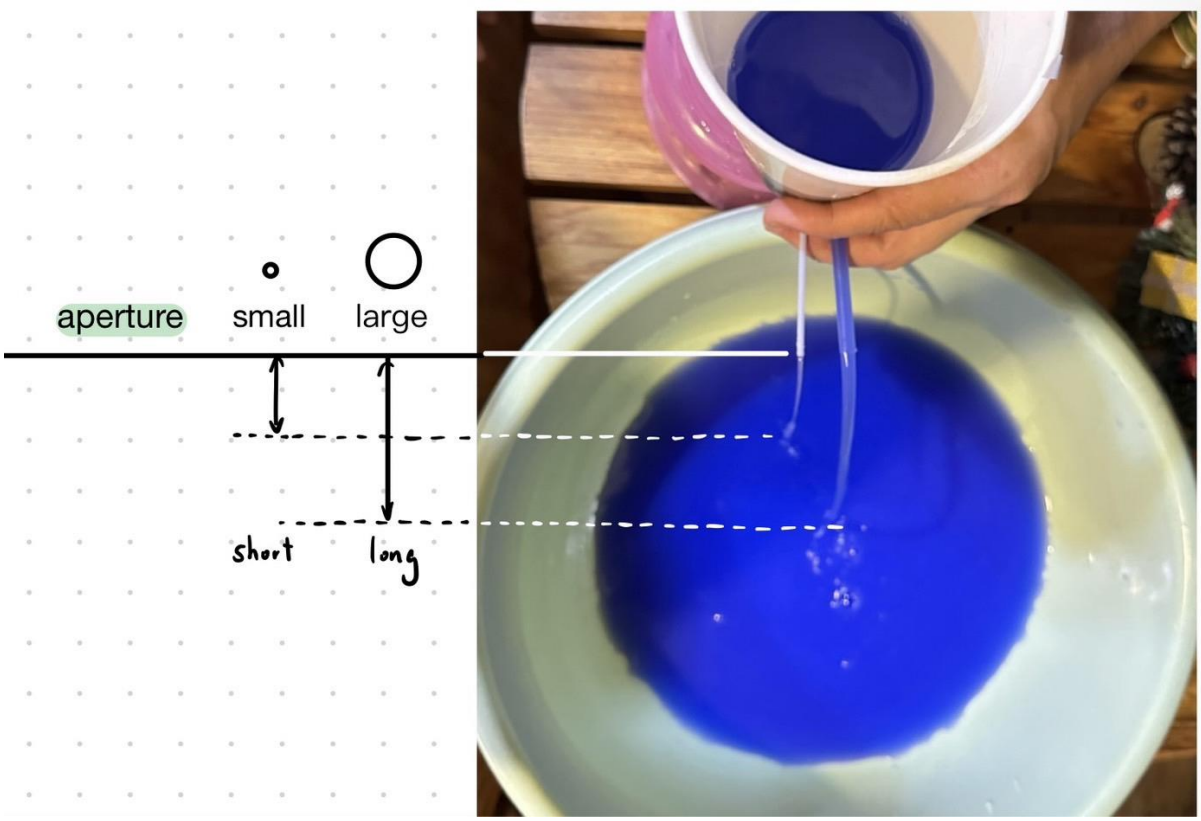
The gas flow is zero at the pipe walls(r=R)

The influence of the friction



Experiment on earth (replace air with water)

- The experiment results of using water instead of air on Earth are similar to those in zero gravity.
- From the picture, we can see that the horizontal range of water output from a small aperture is **shorter** than that of a large aperture
- It can be inferred that under consideration of friction, the smallest diameter pipe **does not** output maximum kinetic energy.



Conclusion

When the pipe aperture is extremely small, friction has a significant impact on gas flow rate and the final output of kinetic energy.

Based on the laminar flow phenomenon and the friction, we can conclude that there is a perfect aperture **between 5 mm and 3 cm** for the maximum gas flow rate and the maximum final output of kinetic energy.

The laminar flow phenomenon still holds under zero gravity.

Future implication

1

Find a perfect aperture **between 5 mm and 3 cm** for the maximum gas flow rate and the maximum final output of kinetic energy.

2

Observe the influence of **different materials** on the final output kinetic energy and flow rate for the same aperture.

Thank you