Team First
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The intent of this experiment was to capture the " fishbone" pattern generated by colliding two jets of water. I conducted this experiment with my teammates Corey Murphy, Ben Clairday and Zachary Taylor

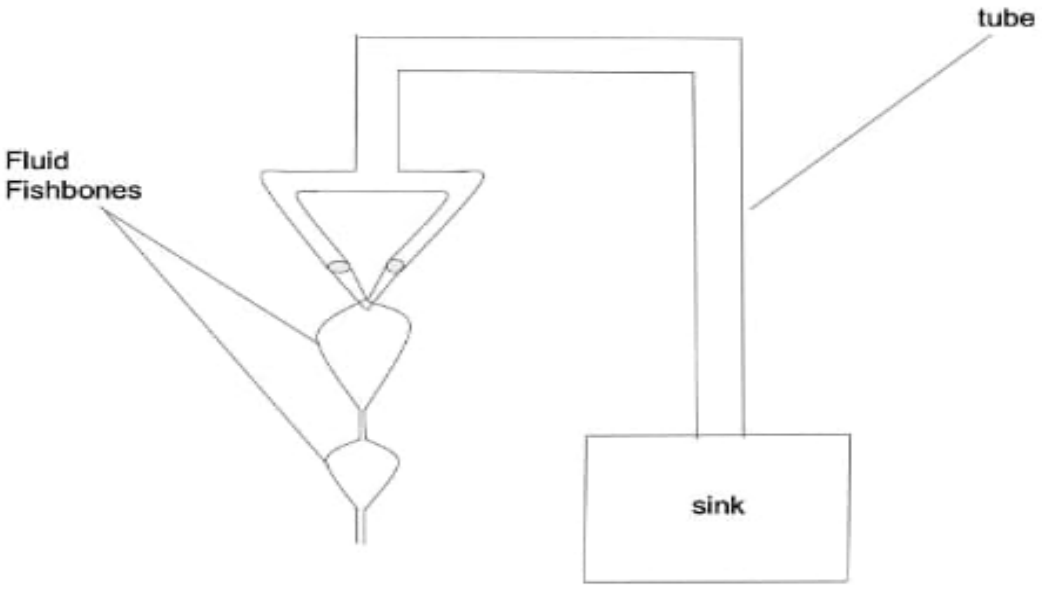

Figure 2: Setup

Discussion:
When colliding two jets of water, at low velocities fluid chains are formed, each comprises of an oval sheet with relatively thick outer boundaries (rim). As the velocity is increased the rims becomes unstable and breaks apart to form "fishbones". The fishbones occur to be the result of a Rayleigh–Plateau instability of the sheet's bounding rims being amplified by the centripetal force associated with the flow along the curved rims Increasing the flow rate broadens the resulting flow structure which we refer to as fluid 'fishbones'. The Reynold's number can be estimated as

$$R = \rho UD/\mu = 8867,$$

ρ and μ are the density and viscosity values of water. The velocity of the jet(U) can be calculated using the formula

$$\text{U}=\frac{Q}{T({R_0}^2-{R_1}^2)} = 2.03\ m/s$$

Q is the flow rate, which is 2.2 gpm for a standard sink and the outer and inner diameters of the tubes are ¼" OD and 0.17" ID This shows that the collision of the jet is a turbulent flow.

Photography and Specification:
We used a sink and connected it to a set of pipes using an adapter. The diameter of the larger pipe is 3/8” OD and 1/4” ID. The smaller connecting tubes from which the water jets were made to collide are 1/4" OD and 0.170” ID. The larger tube was placed in a cabinet handle and the smaller tubes have been glued by a duct tape to make it stable. We used a black plastic sheet as a background and had a golden light to illuminate the image. The tap was turned on and we took images of the fishbone pattern that was generated upon the two jets colliding. I used a Canon Rebel T3i camera with an 18-55mm lens and the settings used are:

1. Aperture: f/5.6
2. Shutter speed:1/250
3. ISO: 1600
4. Focus: 55mm

Due to the nature of the experimental setup, I did not make any edits to the original image other than cropping it to reduce the pixels resolution and cropped the image using Darktable.

Conclusion:
This image shows a beautiful fluid pattern generated when two jets of water are collided. The lighting in the background adds shine to the image and makes the jet look brighter and more in focus. The golden light illuminates the top half of the image and it looks like the sun’s rays is hitting the jet. Overall I like this image, I should have increased the shutter speed and tried to capture a more detailed pattern and maybe increase the brightness.

References:

1. John. W. M Bush and Alexander E. Hasha, “On the collision of laminar jets: fluid chains and fishbones”, Journal of Fluid Mechanics. (2004).
2. Sungjune Jung, Stephen D. Hoath, Graham D. Martin and Ian M. Hutchings, “Exprimental study of atomization patterns produced by the oblique collision of two viscoelastic liquid jets”, Journal of Non-Newtonian Fluid Mechanics, Volume 166. (2011)