Title: Physics in Nature Presentation: Shape of a Raindrop

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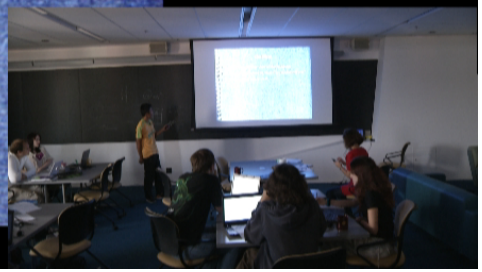
URL: http://pirsa.org/11080107

Abstract:

Outline

- Backgroud—popular view of the raindrops
- Learning about scientific view from traditional one?
- Conclusion and future work

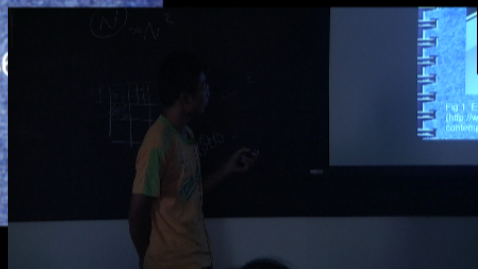


Backgroud

- Popular view of raindrop

Fig.1. Everyday view of drops (http://www.newphotosgalleries.com/Large-home-contemporary-design-for-your-big-family/)

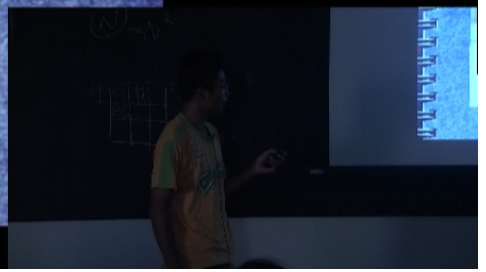
Fig. 2. Teardrop (http://www.fotolia.com/id/2118



Observation

Fig.3 droplets falling from the faucet

Teardrop-like



Observation

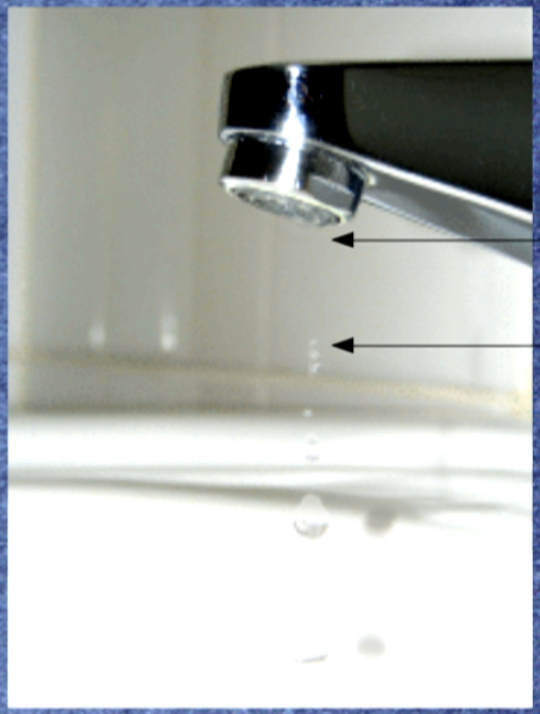
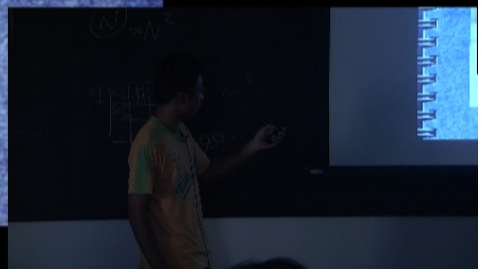


Fig.3 droplets falling from the faucet

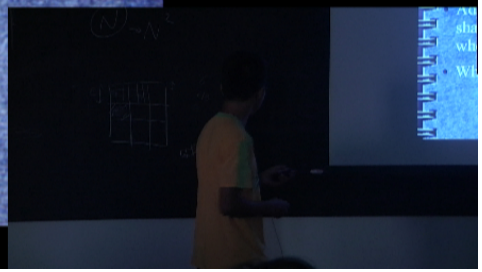
Teardrop-like

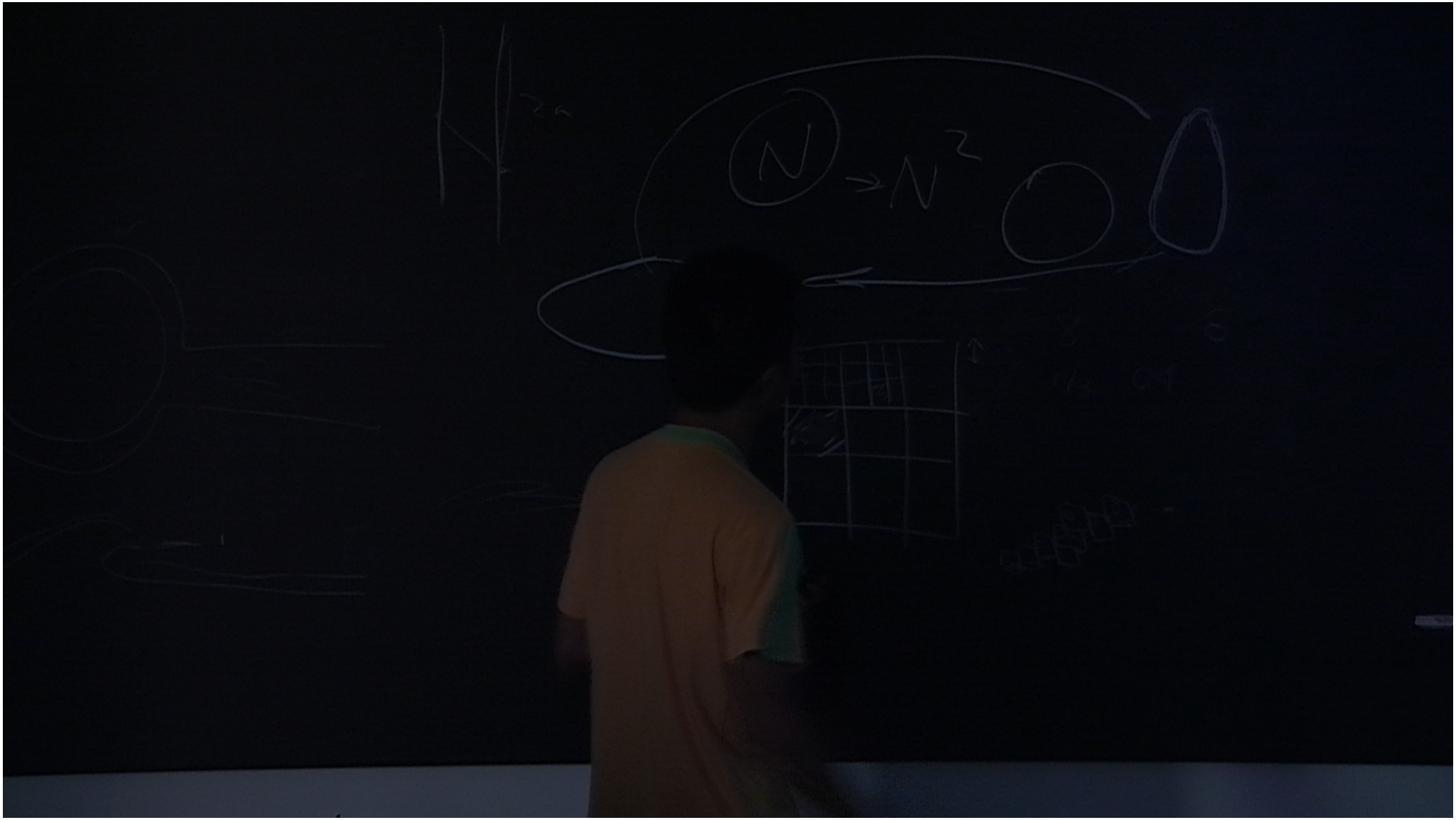
Flattened in the vertical direction

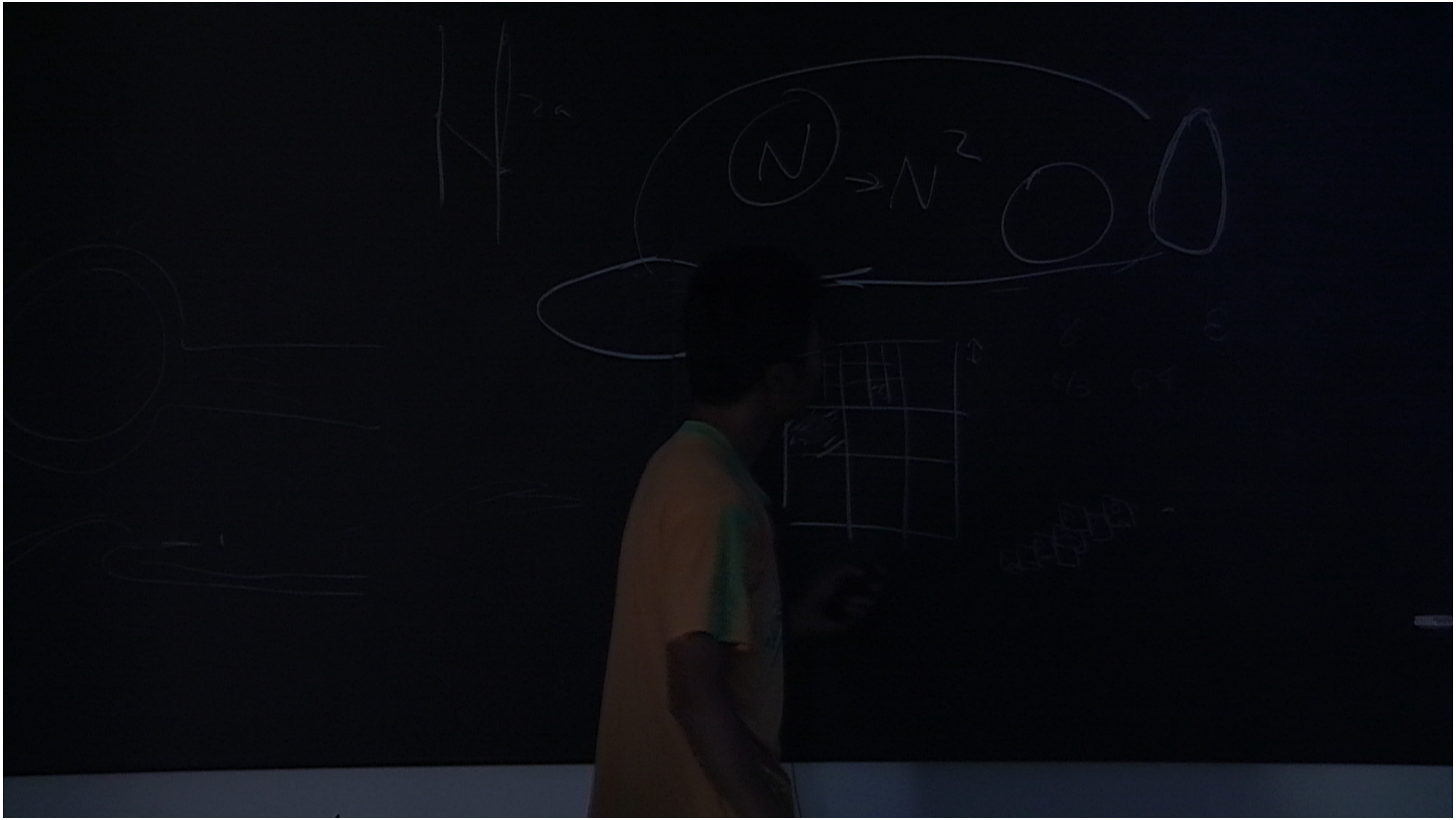


Explanation

- Consider a droplet in vacuum—spherical (smallest surface energy)
- Slight deformation---quivering to get back to spherical shape
- Adding the friction between air and the droplets, shapes of raindrops should finally remain stable when reaching terminal velocity.
- What's the final shape?




N
N→N²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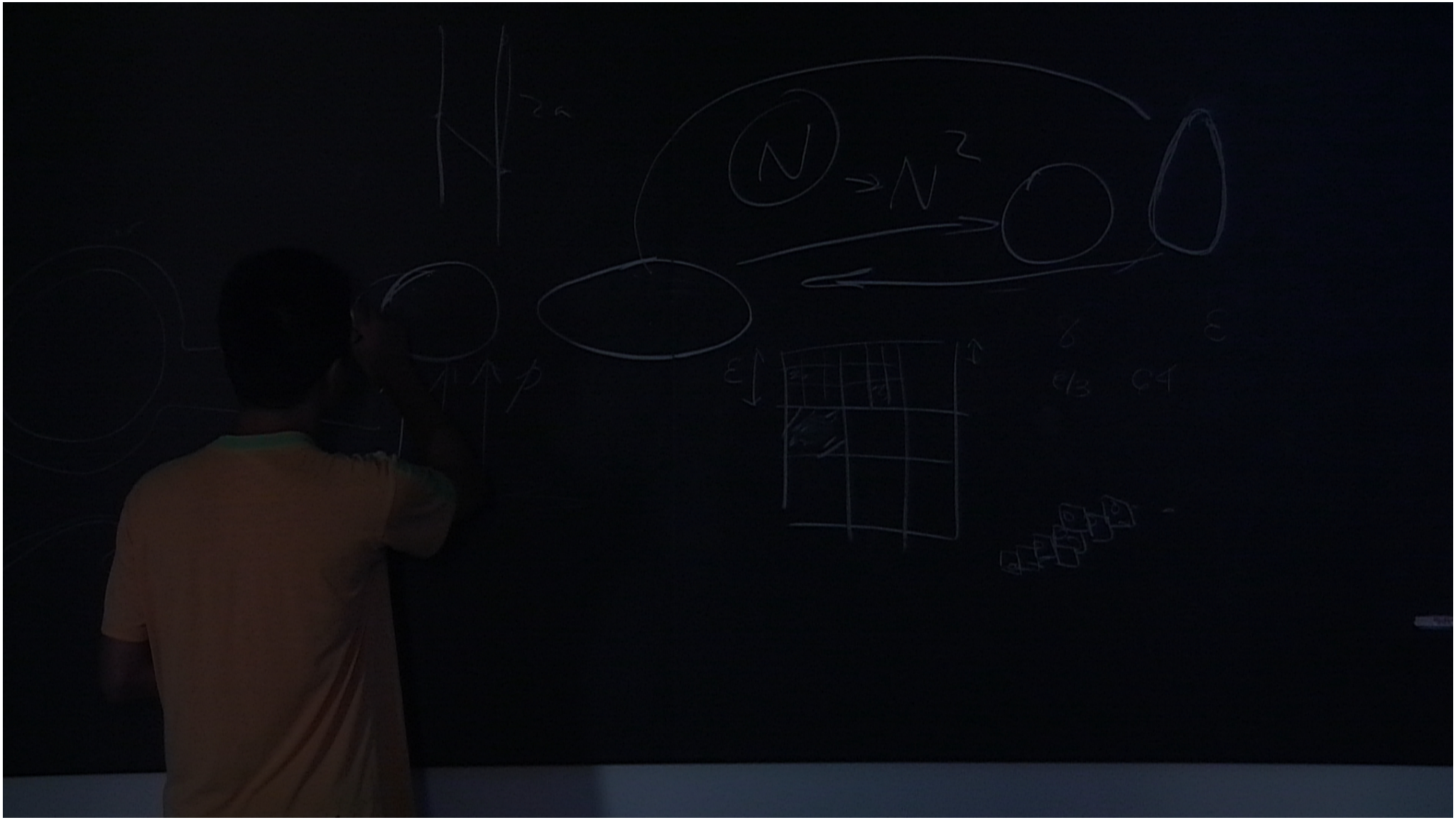

N
N → N²

Analogy

Similar conditions of formation as raindrops

- Force distribution by fluids and sand
  --pressure distribution by air
- Loss of stone mass
  —evaporation of water

Fig.4 Pebble

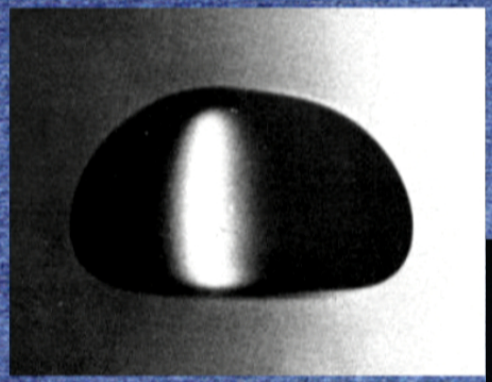


Fig.5 Raindrop

Size of Raindrops

- Fact: No one has seen raindrops like a basketball.

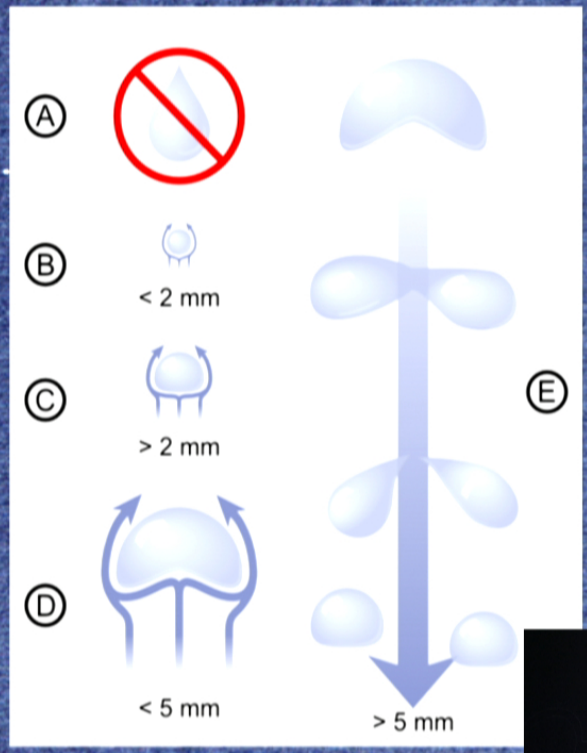
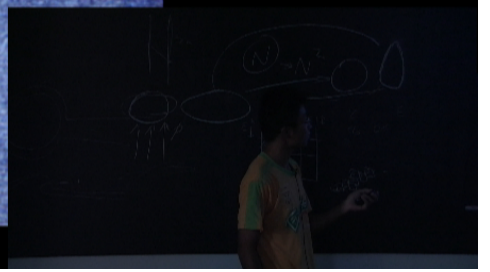
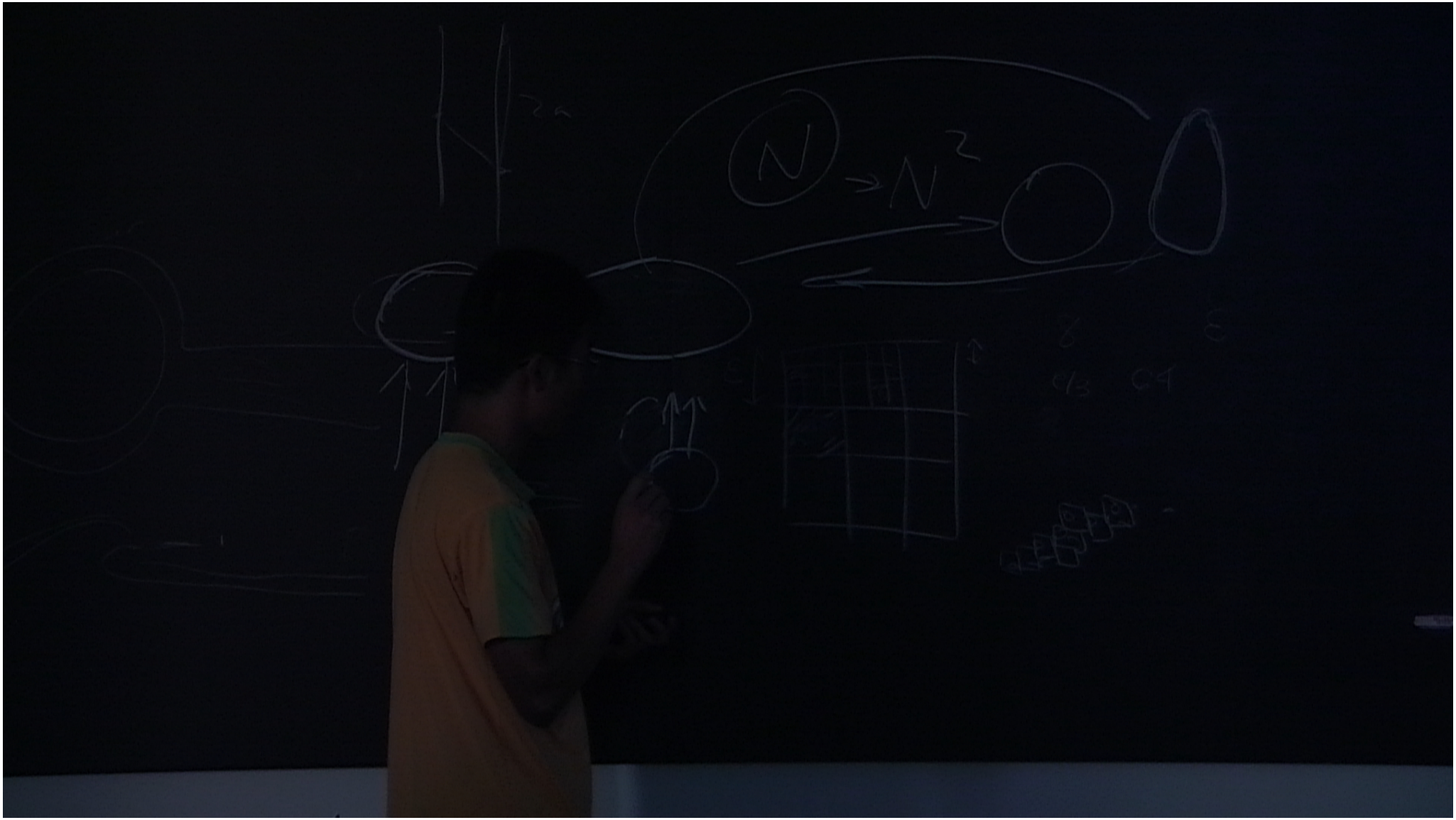


Fig.6 size of raindrops

Conclusion and future work

- The traditional view of raindrops is an invalid generalization from the droplets with forces on the top of them.
- After reaching the constant terminal velocity, the raindrops should be spherical or somewhat flattened but not teardrop-like in shape and not too big in size.
- Calculation for time evolution of the quivering drops.

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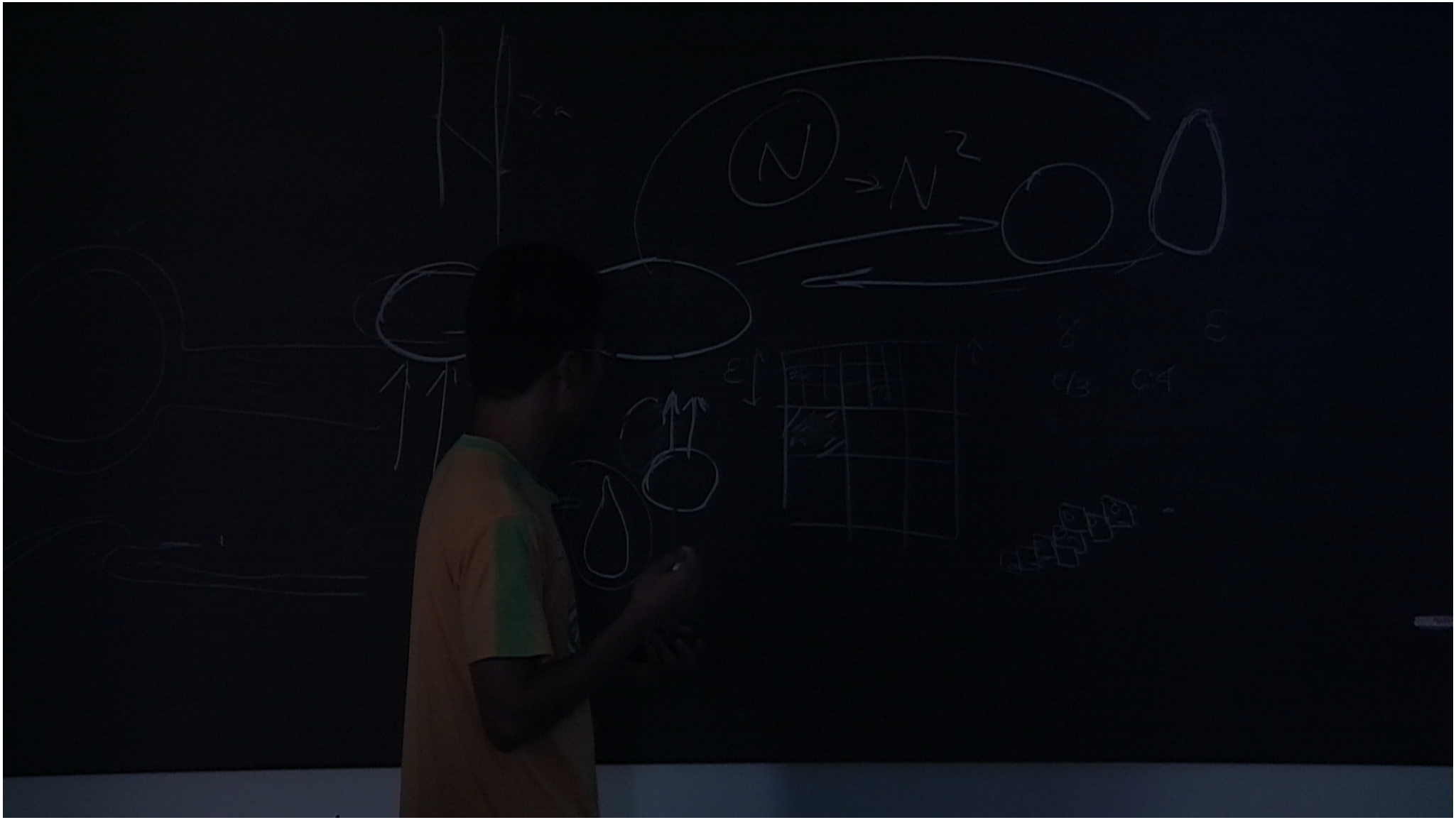
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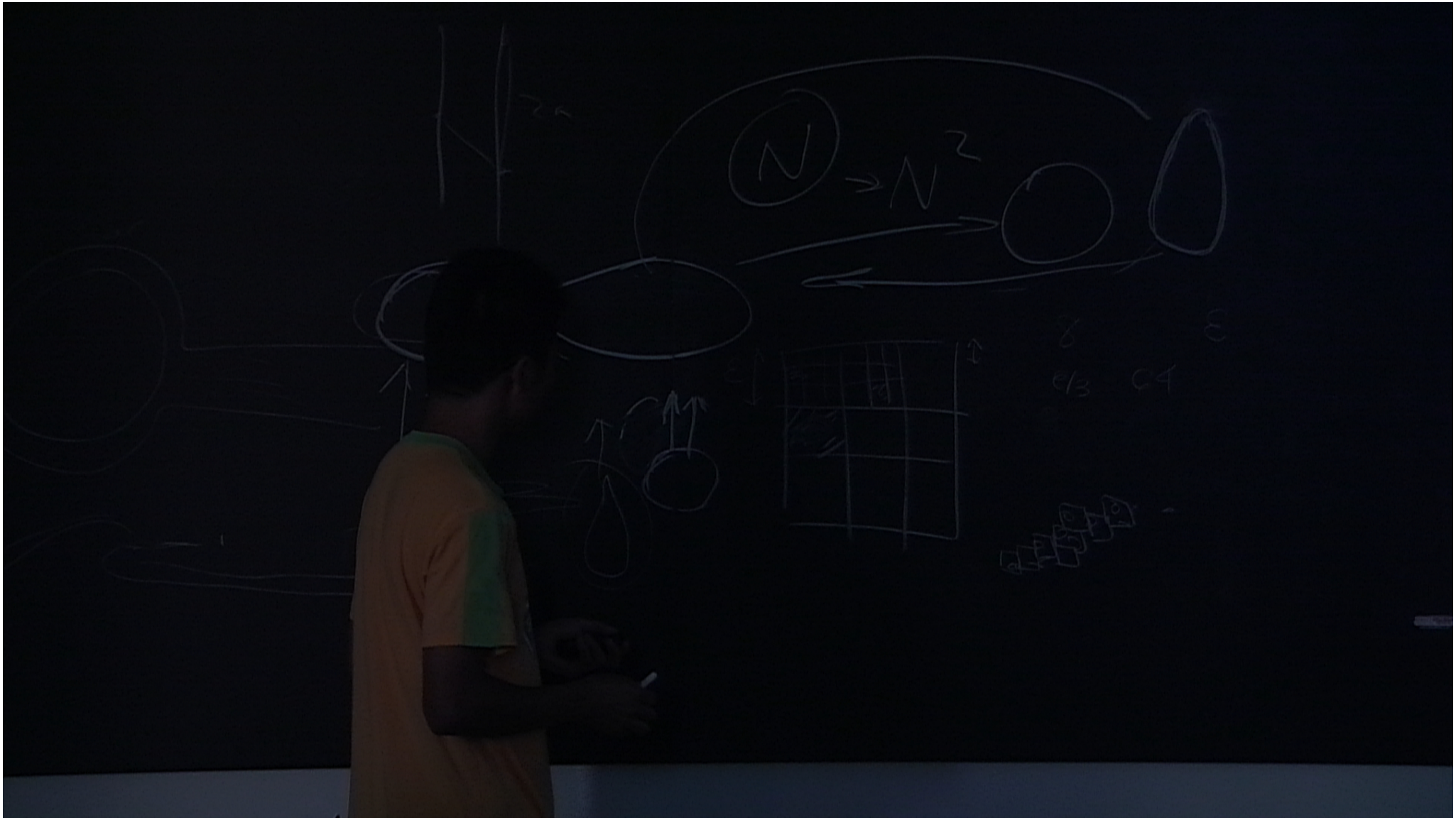
N
N²


Thank you for listening!