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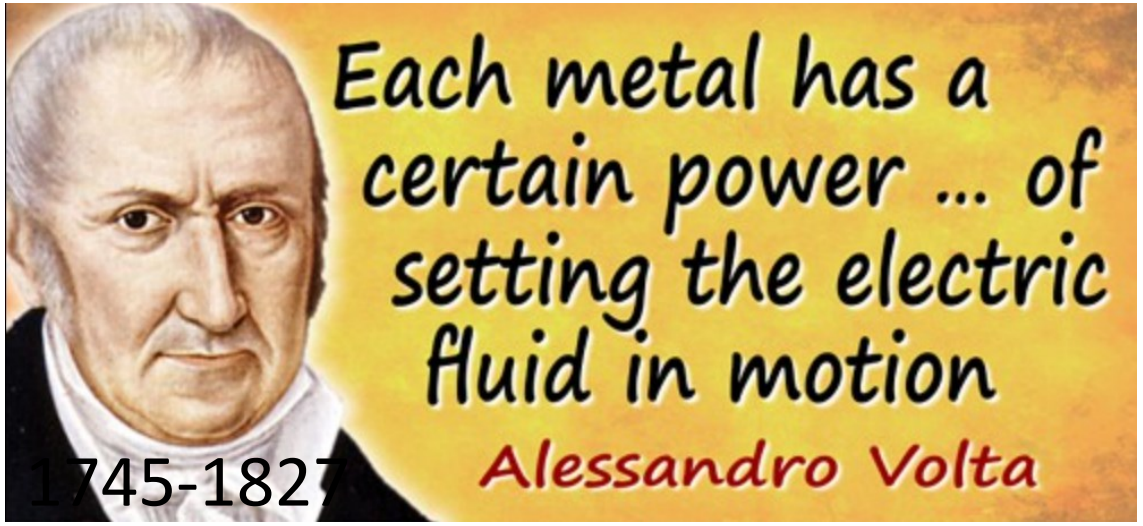
# Not to be used as reference

## List of equations in fluid mechanics

| Physical situation | Nomenclature | Equations |
|---|---|---|
| Fluid statics, pressure gradient | **r** = Position<br>$\rho = \rho(\mathbf{r})$ = Fluid density at gravitational equipotential containing **r**<br>**g** = **g**(**r**) = Gravitational field strength at point **r**<br>$\nabla P$ = Pressure gradient | $\nabla P = \rho \mathbf{g}$ |
| Buoyancy equations | $\rho_f$ = Mass density of the fluid<br>$V_{\text{imm}}$ = Immersed volume of body in fluid<br>$\mathbf{F}_\text{b}$ = Buoyant force<br>$\mathbf{F}_\text{g}$ = Gravitational force<br>$\mathbf{W}_{\text{app}}$ = Apparent weight of immersed body<br>**W** = Actual weight of immersed body | Buoyant force<br>$\mathbf{F}_\text{b} = -\rho_f V_{\text{imm}} \mathbf{g} = -\mathbf{F}_\text{g}$<br>Apparent weight<br>$\mathbf{W}_{\text{app}} = \mathbf{W} - \mathbf{F}_\text{b}$ |
| Bernoulli's equation | $p_{\text{constant}}$ is the total pressure at a point on a streamline | $p + \rho u^2/2 + \rho g y = p_{\text{constant}}$ |
| Euler equations | $\rho$ = fluid mass density<br>**u** is the flow velocity vector<br>$E$ = total volume energy density<br>$U$ = internal energy per unit mass of fluid<br>$p$ = pressure<br>$\otimes$ denotes the tensor product | $\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \mathbf{u}) = 0$<br>$\frac{\partial \rho \mathbf{u}}{\partial t} + \nabla \cdot (\mathbf{u} \otimes (\rho \mathbf{u})) + \nabla p = 0$<br>$\frac{\partial E}{\partial t} + \nabla \cdot (\mathbf{u}\,(E + p)) = 0$<br>$E = \rho \left( U + \frac{1}{2}\mathbf{u}^2 \right)$ |
| Convective acceleration | | $\mathbf{a} = (\mathbf{u} \cdot \nabla)\,\mathbf{u}$ |
| Navier–Stokes equations | $\mathbf{T}_\text{D}$ = Deviatoric stress tensor<br>**f** = volume density of the body forces acting on the fluid<br>$\nabla$ here is the del operator. | $\rho \left( \frac{\partial \mathbf{u}}{\partial t} + \mathbf{u} \cdot \nabla \mathbf{u} \right) = -\nabla p + \nabla \cdot \mathbf{T}_\text{D} + \mathbf{f}$ |

Famous Quote

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## Fluid theory of electricity

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**Fluid theories of electricity**[1][2] are outdated theories that postulated one or more electrical fluids which were thought to be responsible for many electrical phenomena in the history of electromagnetism. The **"two-fluid" theory of electricity**, created by Charles François de Cisternay du Fay, postulated that electricity was the interaction between two electrical 'fluids.' An alternate simpler theory was proposed by Benjamin Franklin, called the **unitary, or one-fluid, theory of electricity**. This theory claimed that electricity was really one fluid, which could be present in excess, or absent from a body, thus explaining its electrical charge. Franklin's theory explained how charges could be dispelled (such as those in Leyden jars) and how they could be passed through a chain of people. The fluid theories of electricity eventually became updated to include the effects of magnetism, and electrons (upon their discovery).

Contents hide



### Fluid theories [edit]

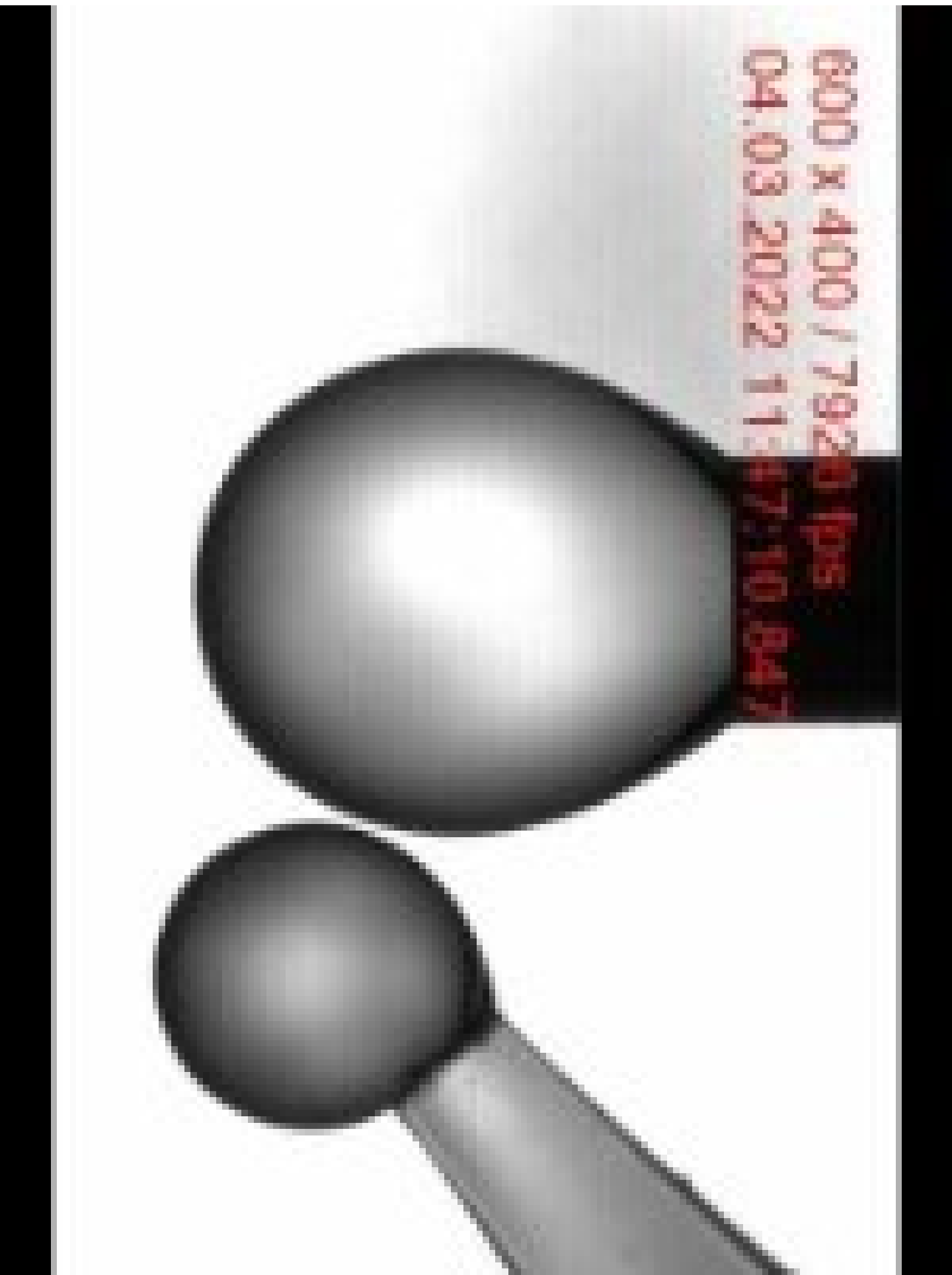
In the 1700s many physical phenomena were thought of in terms of an aether, which was a fluid that could permeate matter. This idea had been used for centuries, and was the basis of thinking about physical phenomena, such as electricity, as liquids. Other 18th century examples of fluid models are Lavoisier's caloric and the magnetic fluids of Coulomb and Aepinus.

# Viscosity: Video-1

https://www.youtube.com/shorts/sDFiWcvNCiI

# Droplet Coalescence: Video-2

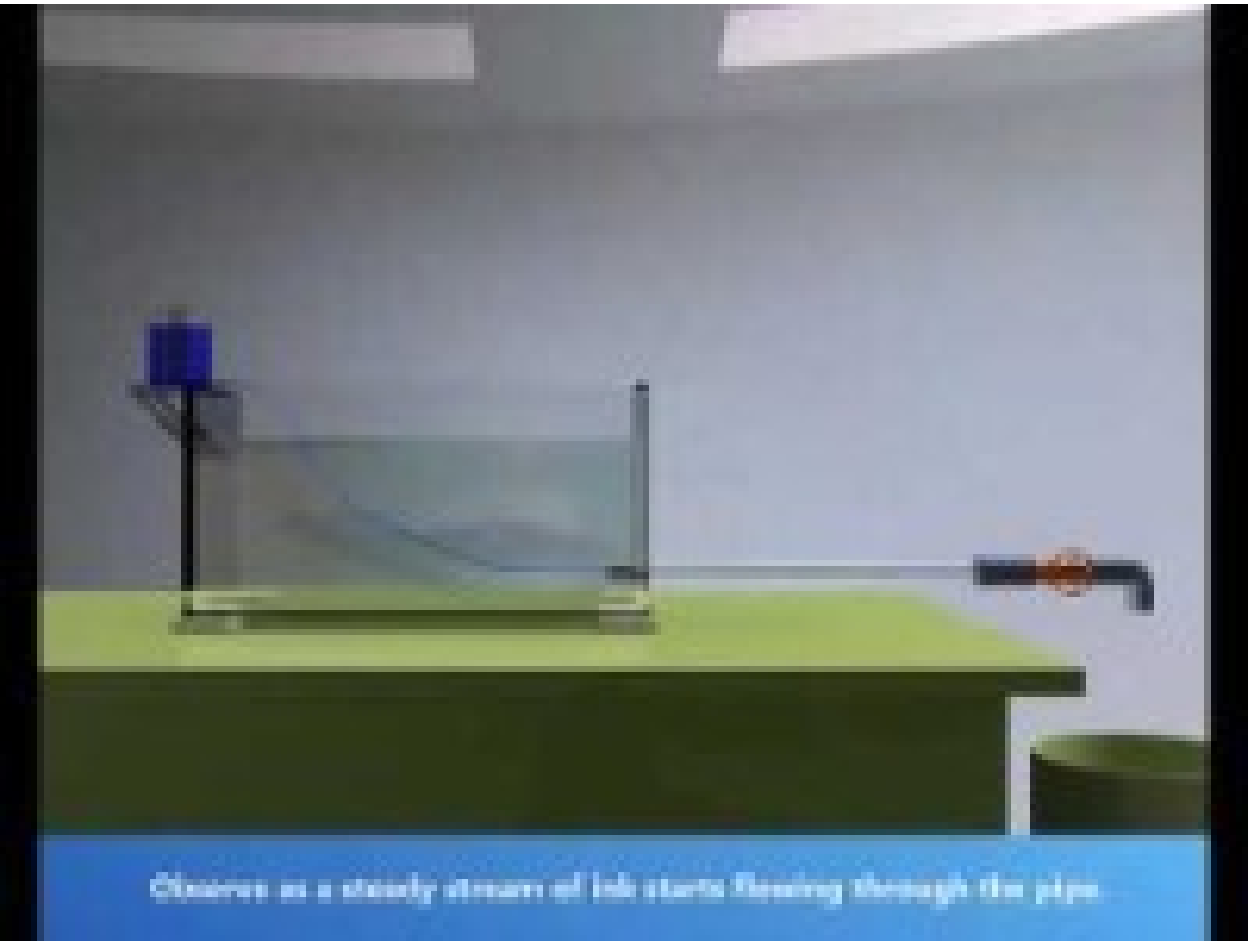
https://www.youtube.com/watch?v=E7Qq1mJZ0CY



# Rigid Body Motion: Video-3

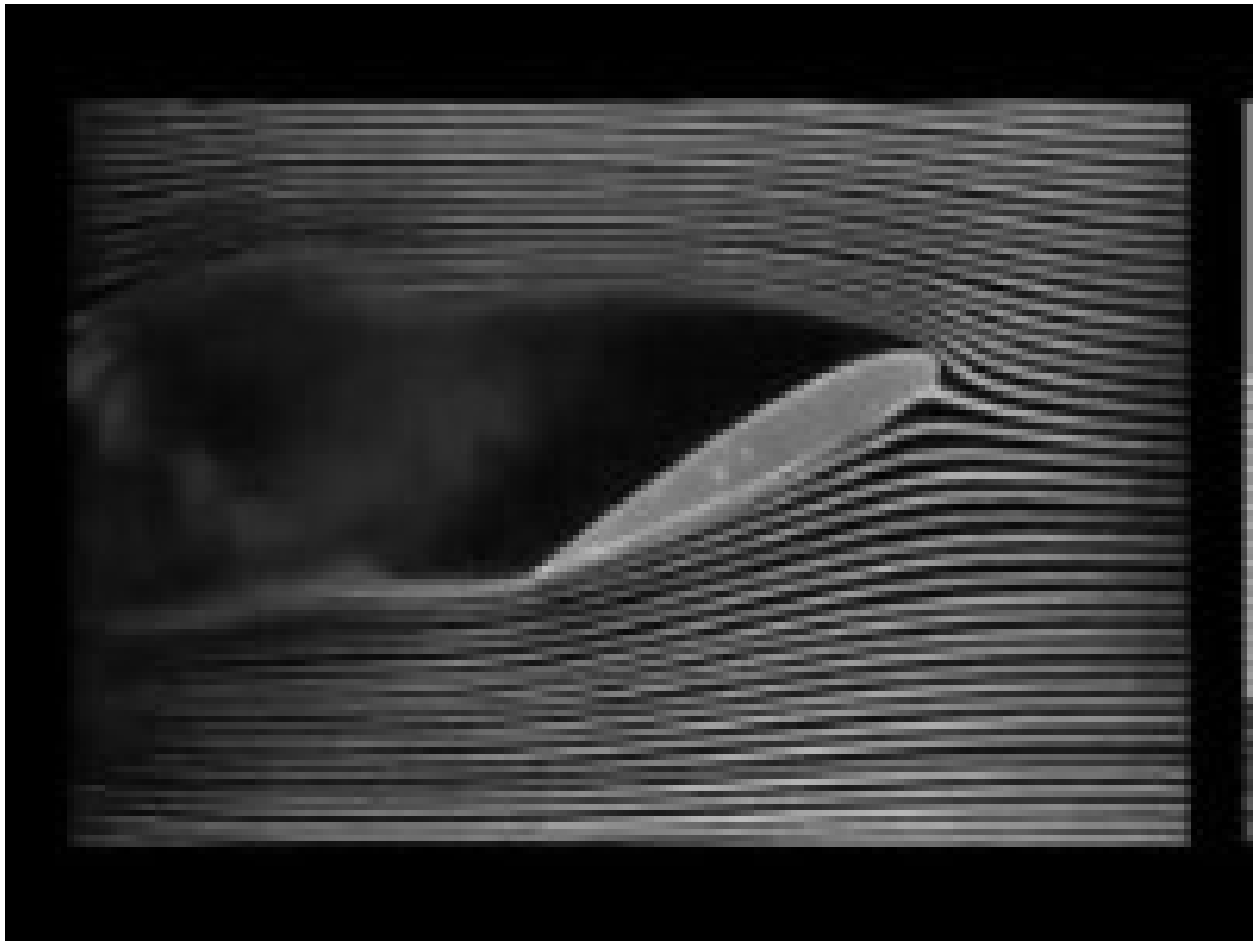
https://youtu.be/y8mzDvpKzfY

# Reynold's experiment: Video-4



https://www.youtube.com/watch?v=U4Mg6KQqIt8

# Airfoil AOA: Video-5



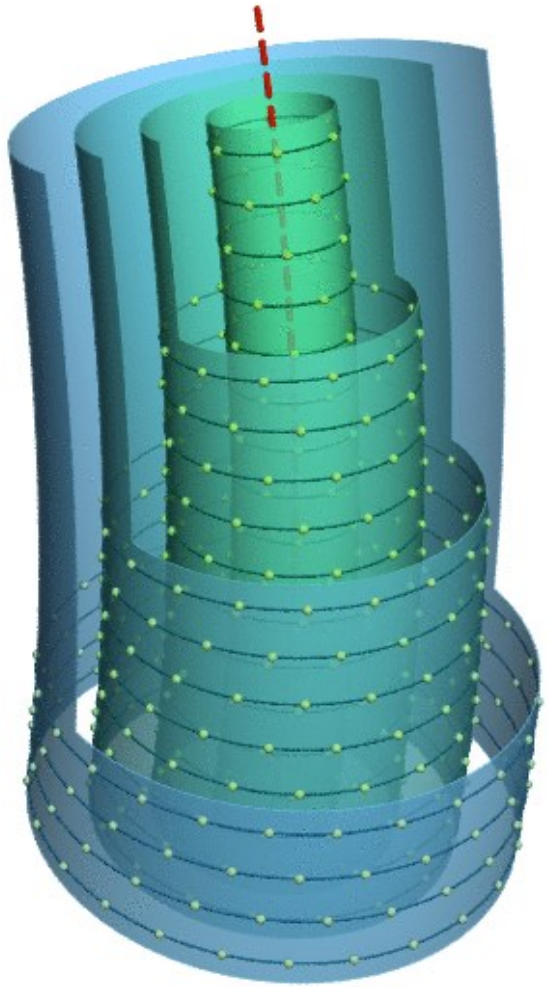
https://www.youtube.com/watch?v=hffyIEZD57E

# Laminar flow: Video-6

https://www.youtube.com/watch?v=aBCfFq3mJ-8

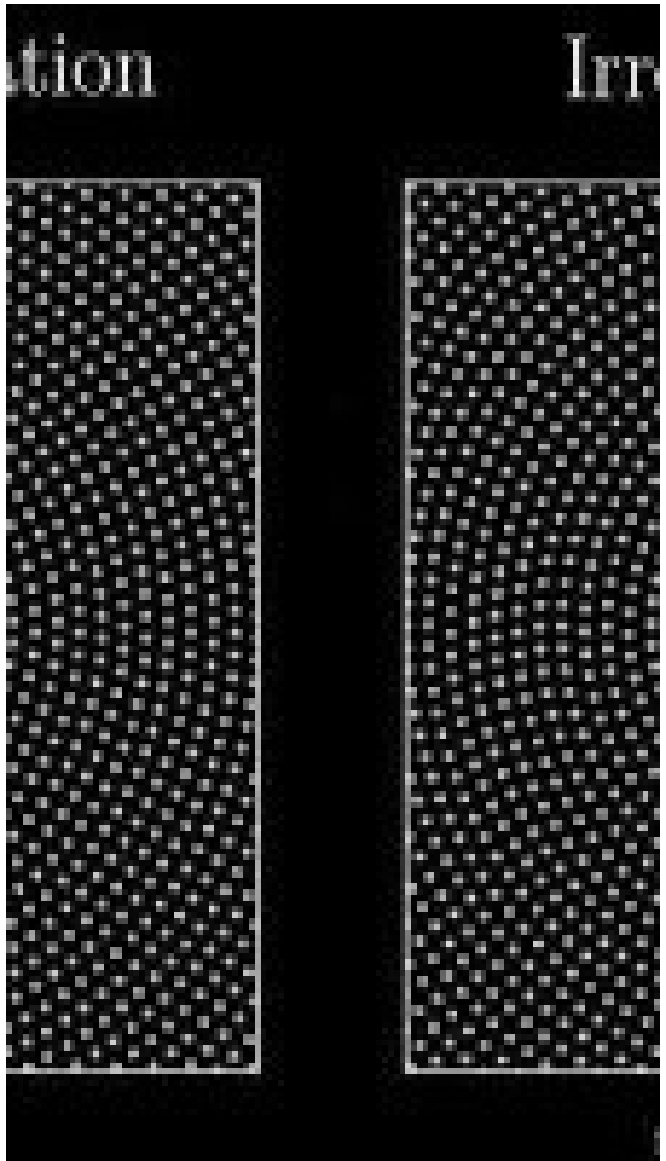
## Irrotational vortex: Video-7

https://upload.wikimedia.org/wikipedia/commons/c/cb/IrrotationalVortexFlow-anim.gif



## Rotational Vs Irrotational vortex: Video-8

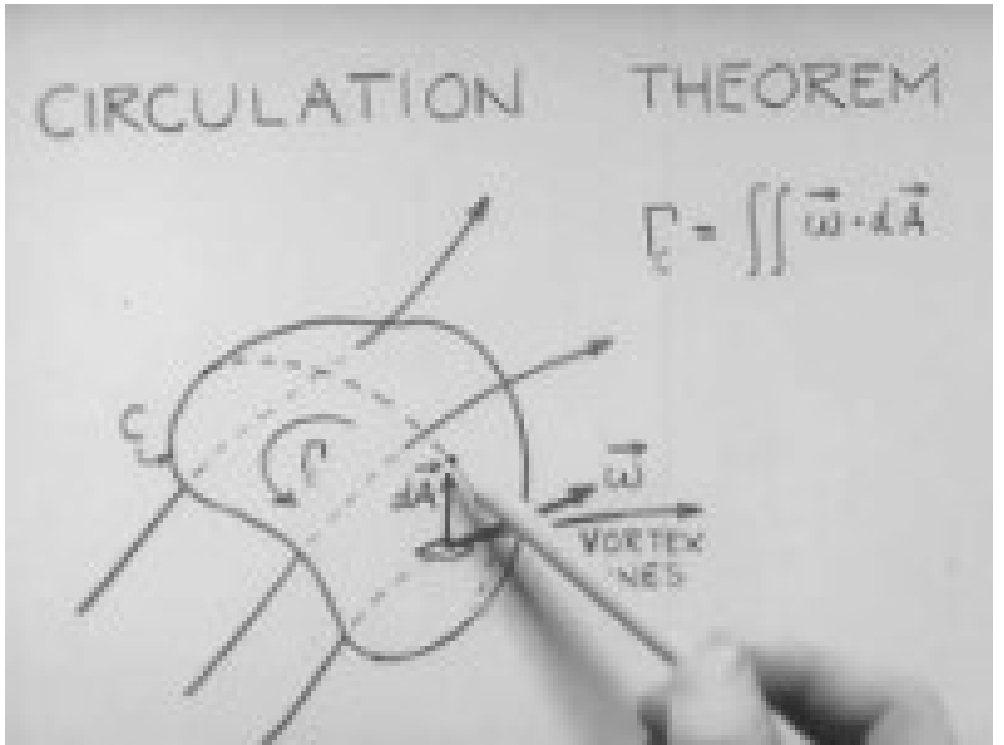
https://www.youtube.com/shorts/DwxtJKZDK98



Must watch

## Vorticity: Ascher Shapiro (Video-9)

https://www.youtube.com/watch?v=pOA3VJHCnWs



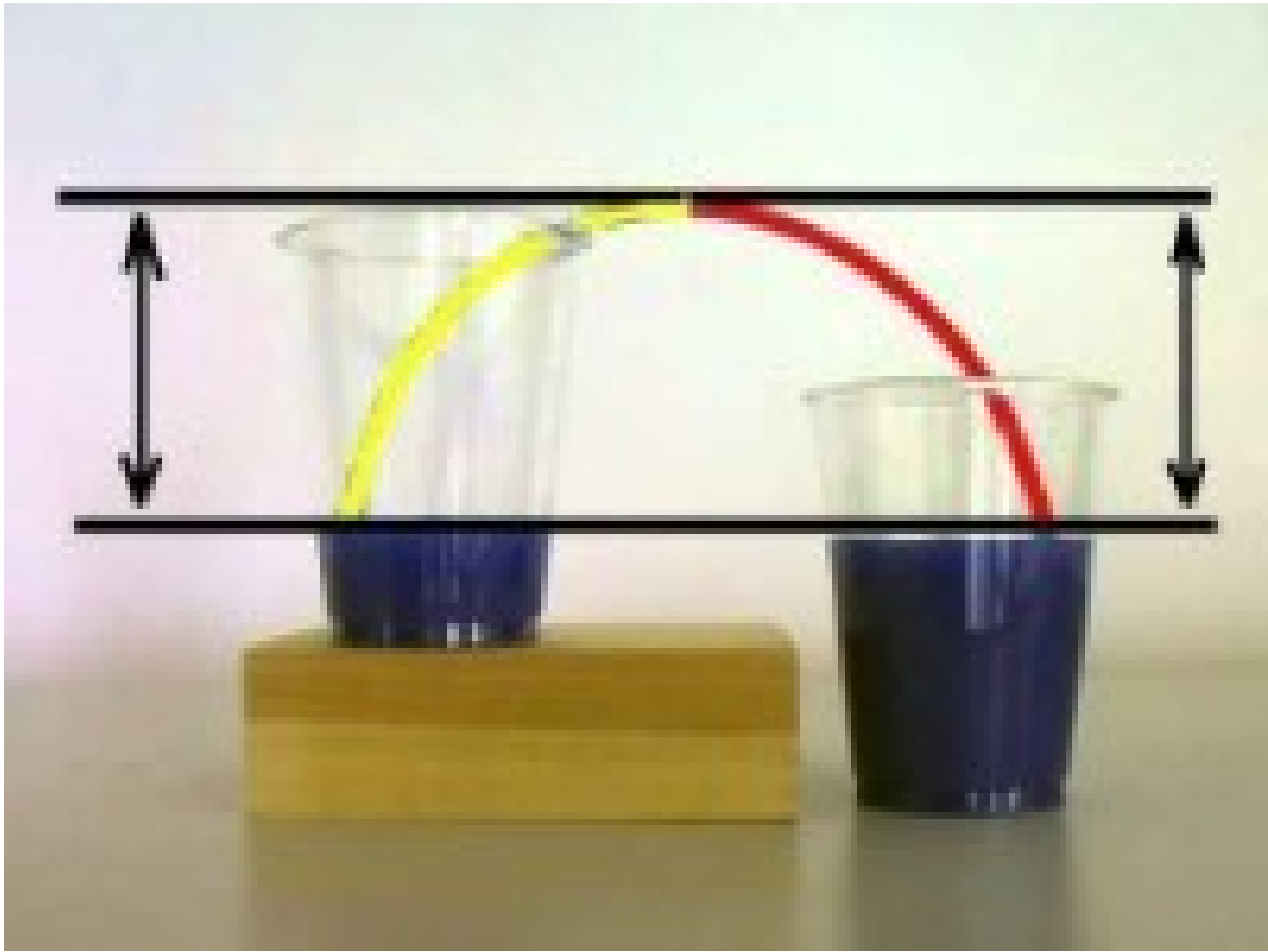
# Bernoulli's principle: Video-10

https://www.youtube.com/watch?v=PPweiE9Z568

Video 11: https://www.youtube.com/watch?v=1TQL1ju3RoQ

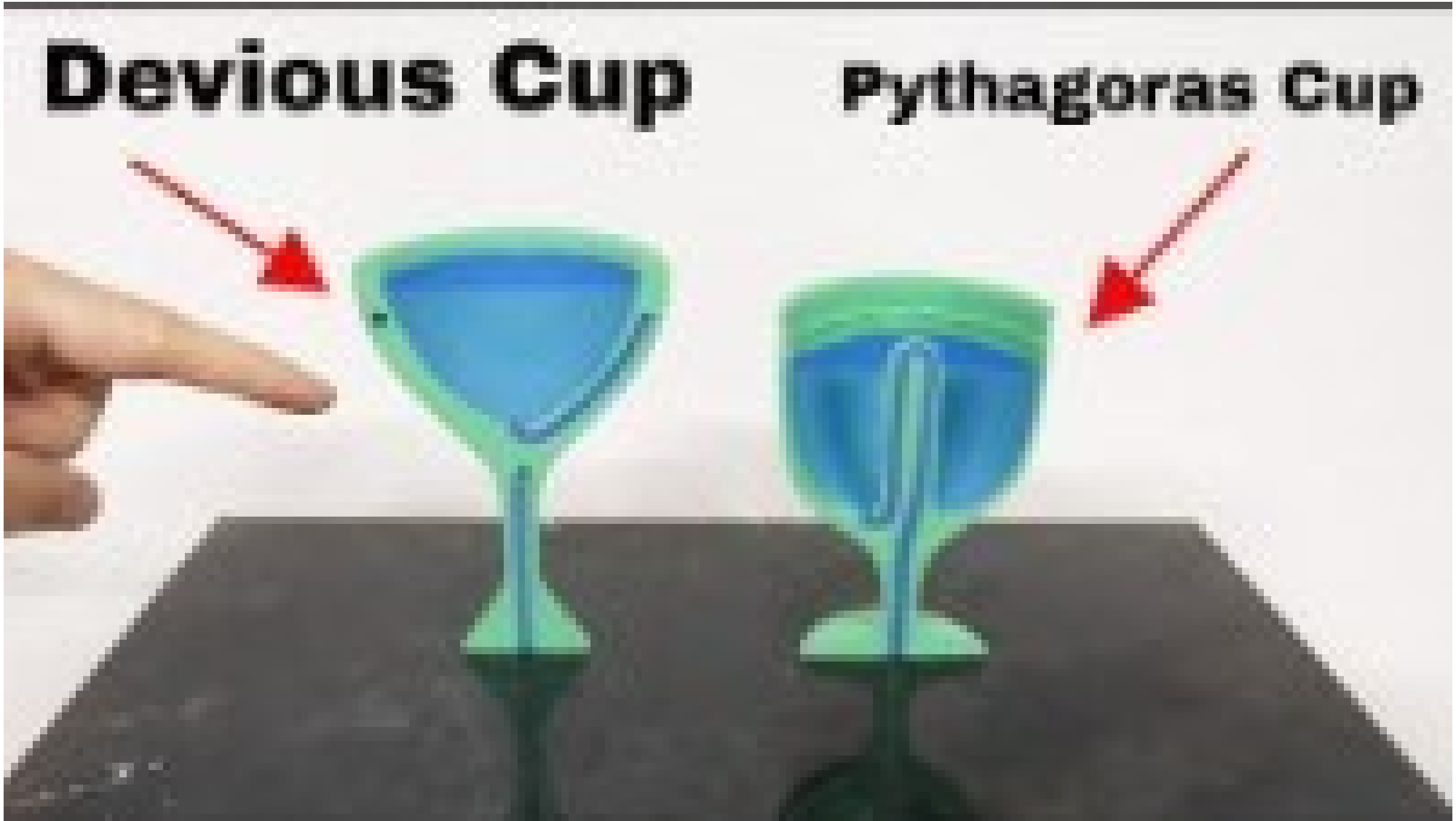
Video 12:
https://www.youtube.com/shorts/V510005jDug

Video 13: https://www.youtube.com/watch?v=CZmP0vsRBZ8



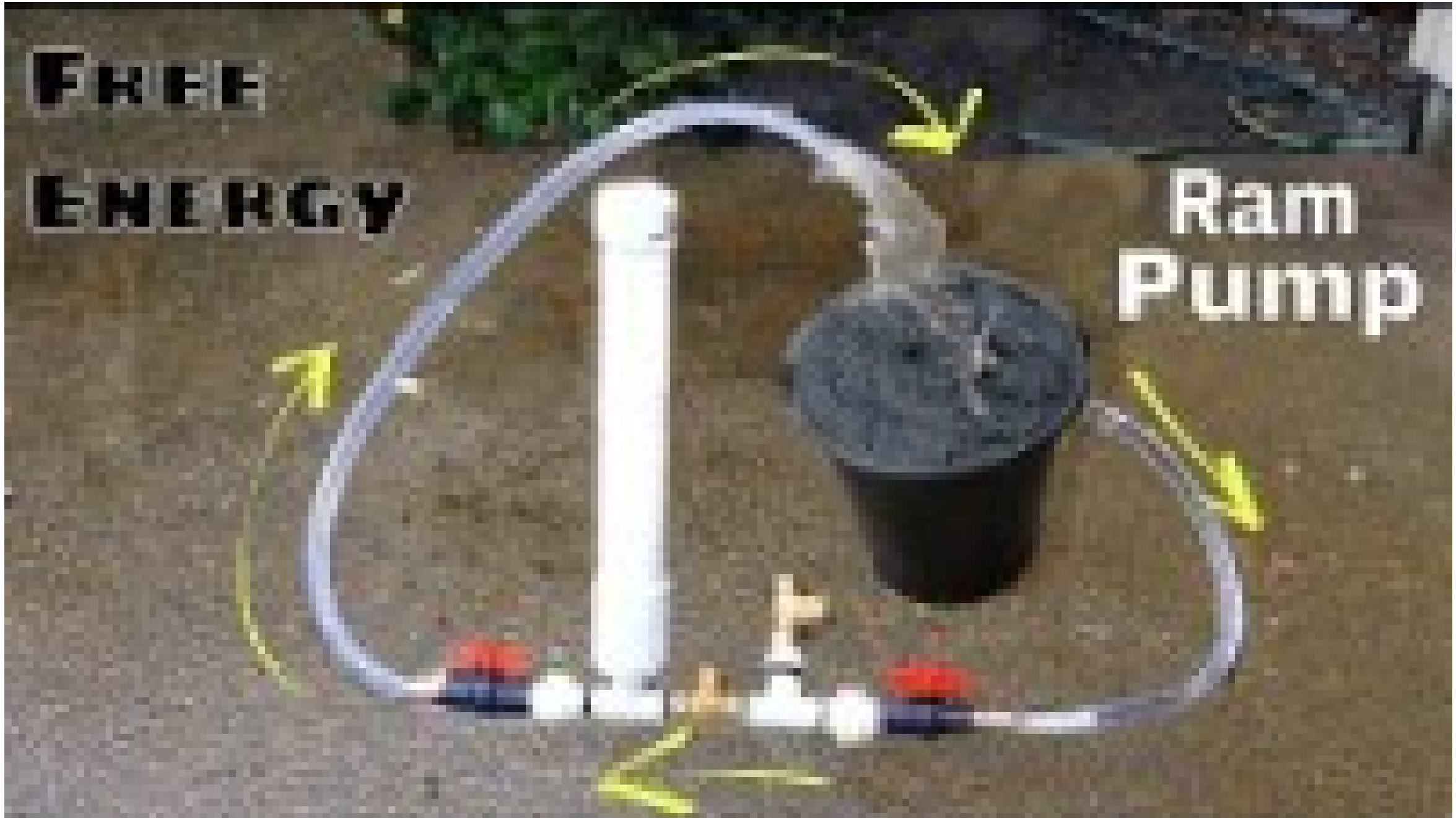
Video 14 https://www.youtube.com/watch?v=cMVFCeoysXc&t=81s

Video 15: https://www.youtube.com/watch?v=Gav25xB0LtE&t=309s

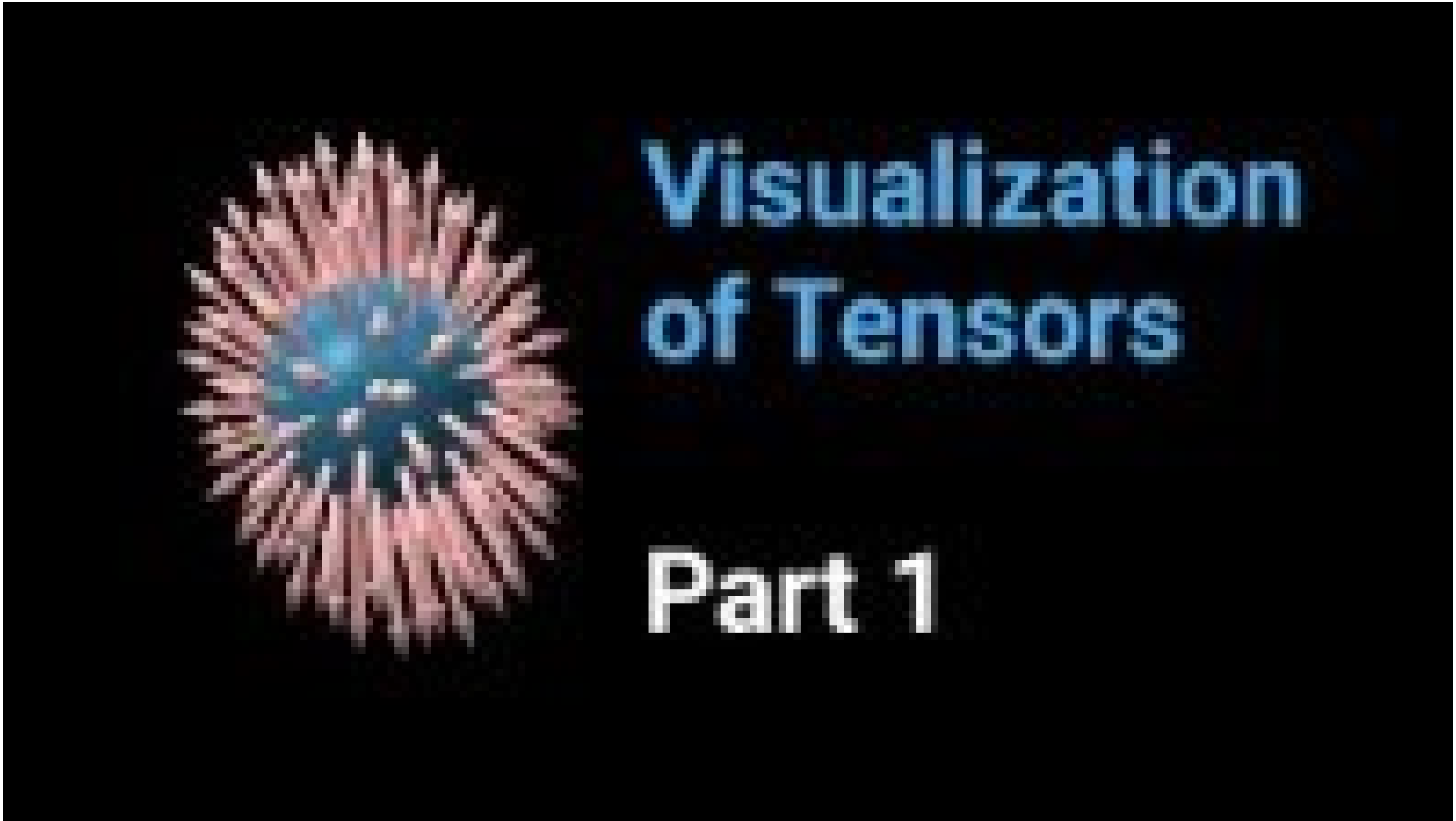


Video 16 https://www.youtube.com/watch?v=snZt4G_7f6A

Video 17 https://www.youtube.com/watch?v=9NHVmOchAgI



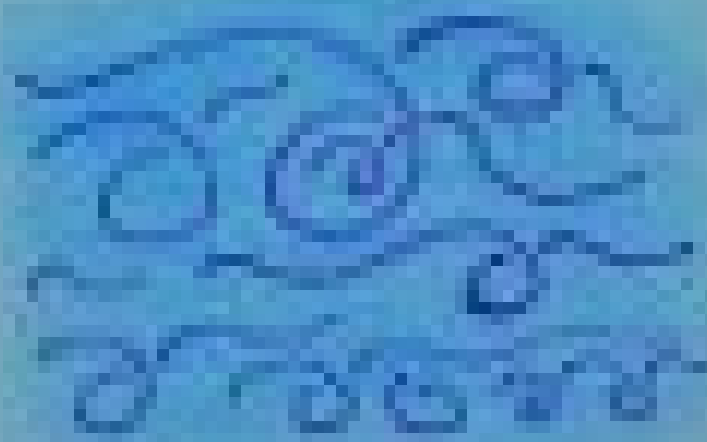
Video 18: https://www.youtube.com/watch?v=YxXyN2ifK8A



Video 19: https://www.youtube.com/watch?v=XoefjJdFq6k&t=326s

# Navier-Stokes Equations

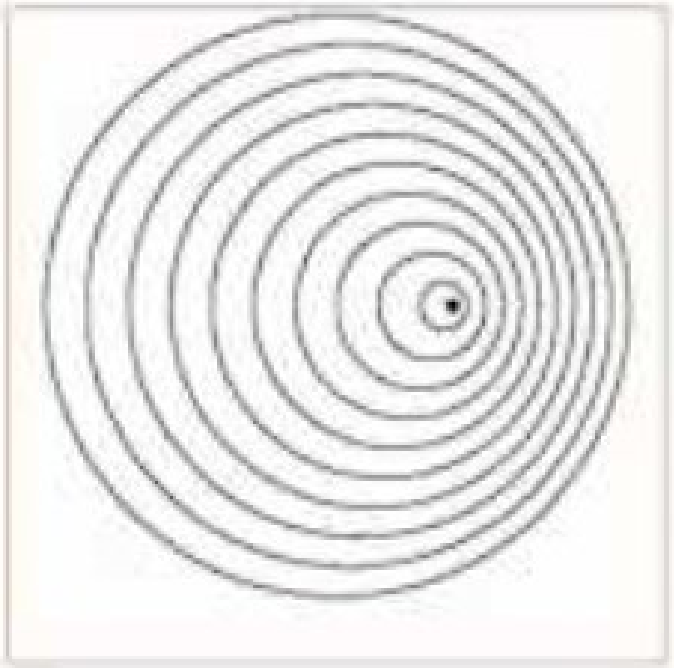
$$\nabla^2 \vec{u} \iff \vec{u} \cdot \nabla \vec{u}$$



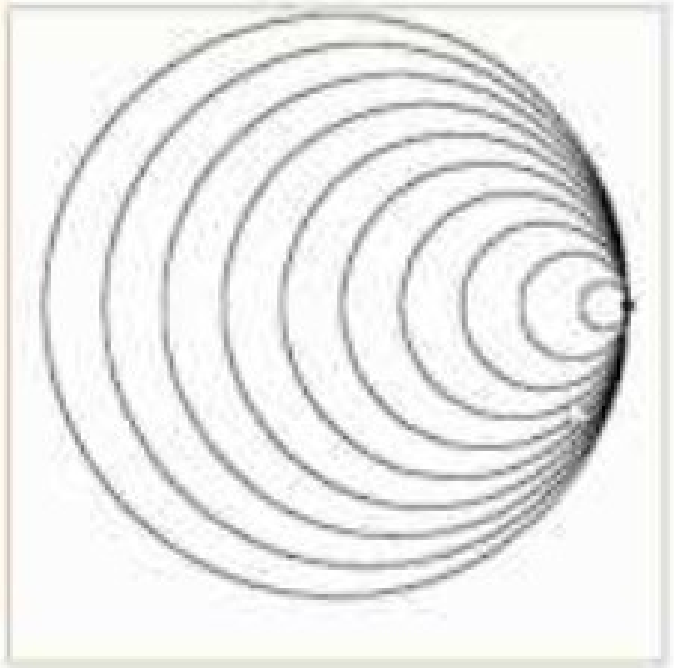
Video 20: https://www.youtube.com/watch?v=7tjf8HWiR3Y

Video 21: https://www.youtube.com/watch?v=SibnBH4Htjo

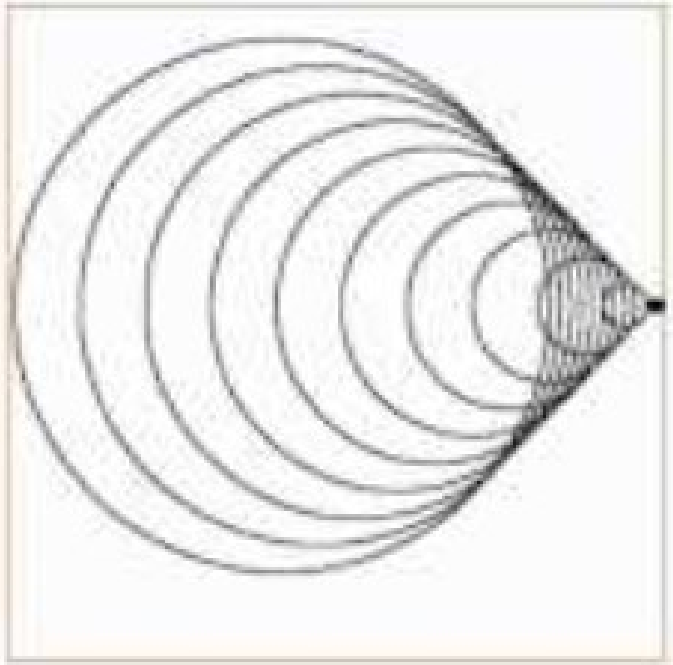
Video 22: https://www.youtube.com/watch?v=omHazYg7lwM



$v_{source} < v_{wave}$

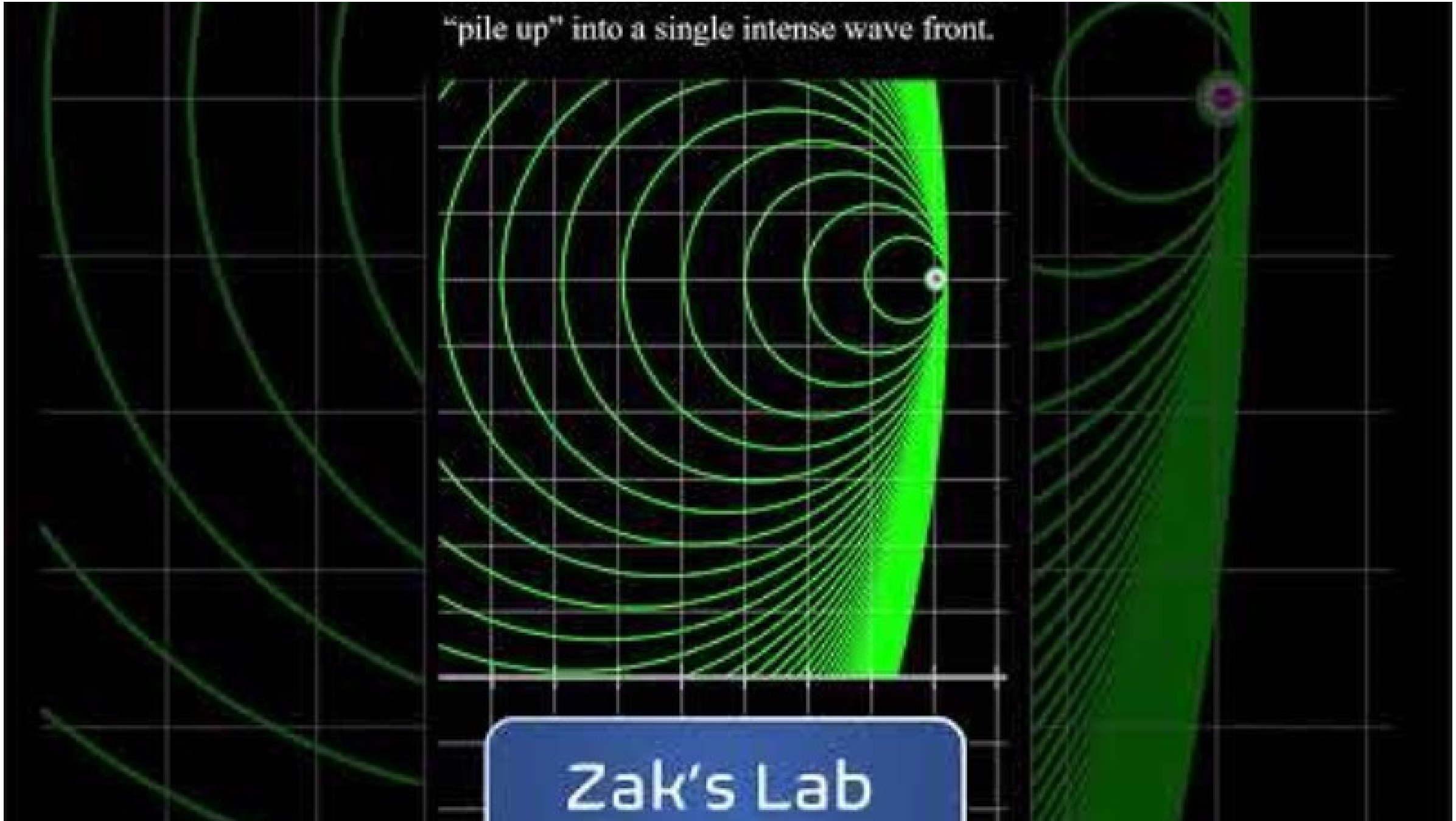


$v_{source} = v_{wave}$

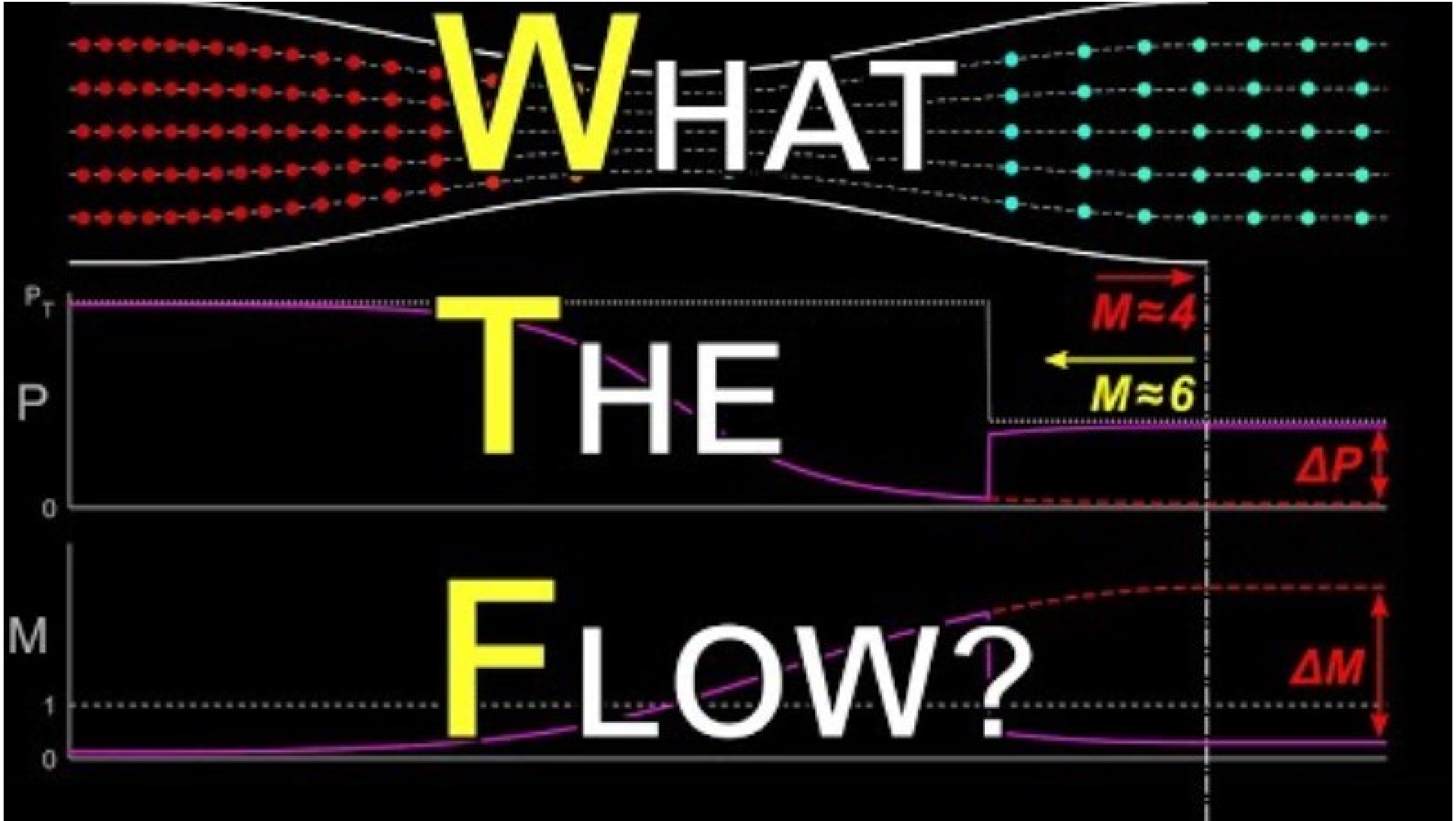


$v_{source} > v_{wave}$

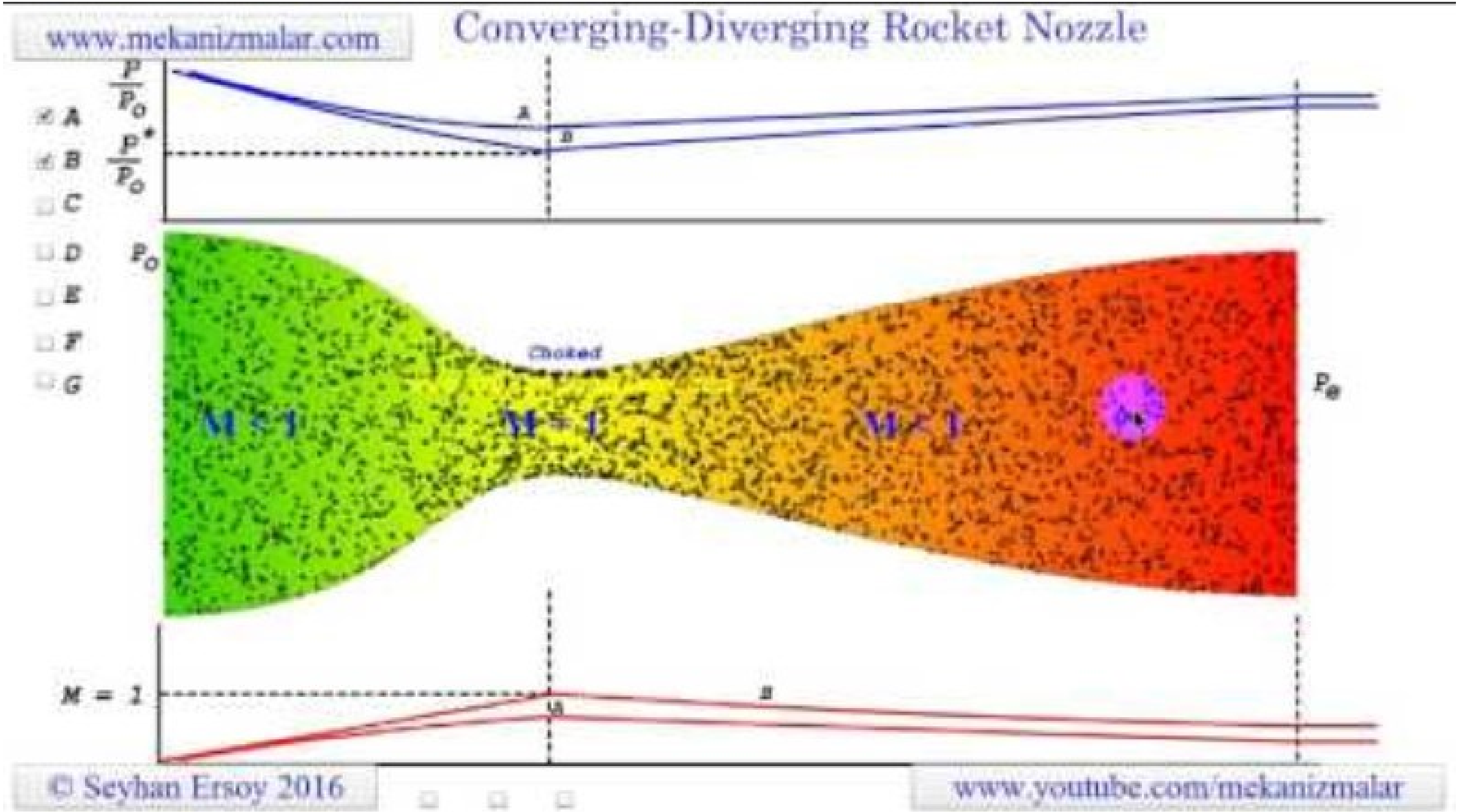
Video 23: https://www.youtube.com/watch?v=Hxmt6MpSEgo



Video 24: https://www.youtube.com/watch?v=I8ntKdaKxV4



Video 25: https://www.youtube.com/watch?v=0ycxMTUnruw



Video 26: https://www.youtube.com/watch?v=dRxafN0JU3Q&t=1s