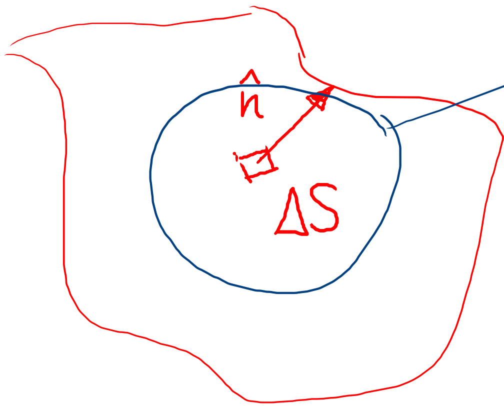
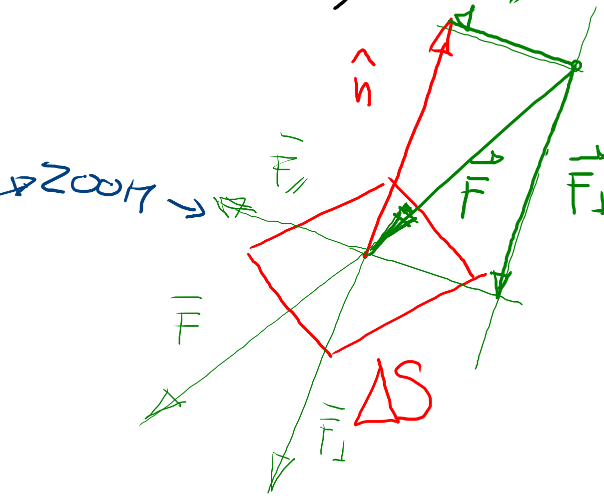
FLUIDOSTATICA

(liquidi → IDROSTATICA)

Assumiamo i liquidi **incomprimibili**
(volume proprio)

PRESSIONE





$$p = \frac{|\vec{F}_\perp|}{\Delta S}$$ è uno scalare

$$\frac{N}{m^2} = Pa$$ Pascal

cgs : $\dfrac{\text{dyne}}{\text{cm}^2}$ = ~~baria~~ = $\dfrac{10^{-5}\ \text{N}}{(10^{-2}\ \text{m})^2} = 10^{-1}$ Pa

1 atm = 101 300 Pa $\cong 10^{5}$ Pa

$\overset{!}{=}$ 760 mmHg = 760 Torr

1 bar = 10^{6} barie = 10^{5} Pa $\cong$ 1 atm

1 mbar = 10^{-3} bar

1 hPa = 10^{2} Pa

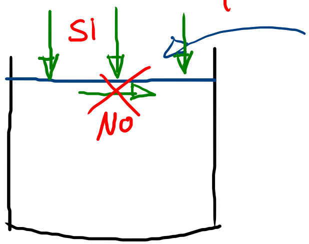
1 atm $\cong 10^{3}$ hPa

$\dfrac{\text{lb}}{\text{in}^2}$

FLUIDO STATICA

↑ il liquido è in equilibrio

(1)



superficie limite del fluido
(NON ci possono essere forze tangenti ma solo normali)

(2) Principio di isotropia della pressione

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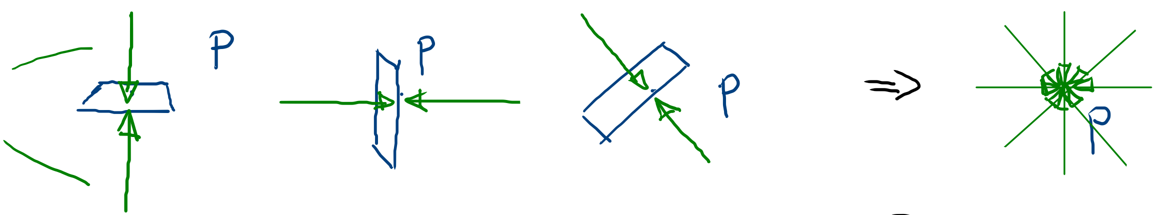
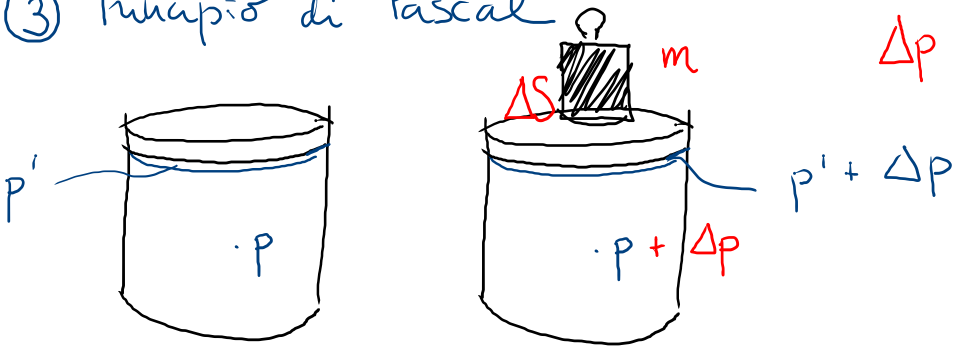
stesso modulo!



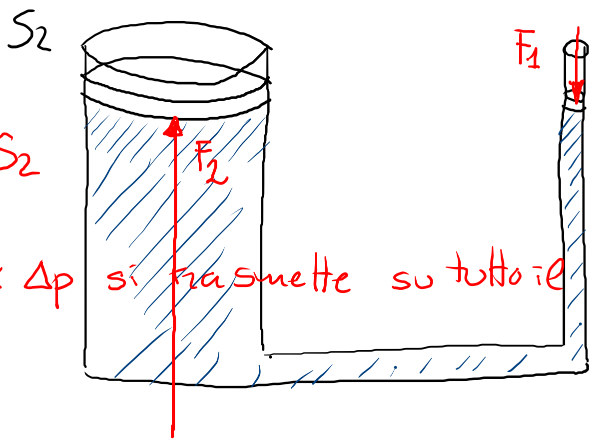
pressione nel punto P

③ Principio di Pascal



$$\Delta p = \frac{mg}{\Delta S}$$

applicazioni : leva idraulica
martinetto idraulico



$$F_2 = \Delta p \cdot S_2$$

** $\Delta p = \frac{F_2}{S_2}$

* $\Delta p = \frac{F_1}{S_1}$

« Δp si trasmette su tutto il fluido »

* = **

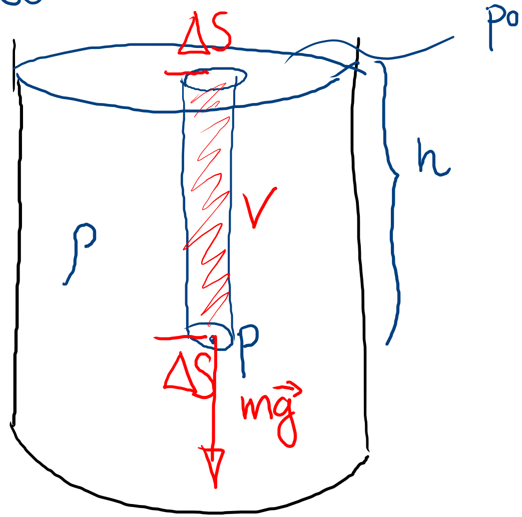
$$\frac{F_1}{S_1} = \frac{F_2}{S_2}$$

$$F_2 = \frac{S_2}{S_1} F_1 \qquad \left(\frac{S_2}{S_1} \gg 1\right)$$

$$F_2 \gg F_1$$

④ Legge di Stevino

ρ densità $\rho_{H_2O} = 10^3 \frac{Kg}{m^3}$



$$V = \Delta S \cdot h$$

$$m = V\rho = \Delta S \cdot h \cdot \rho$$

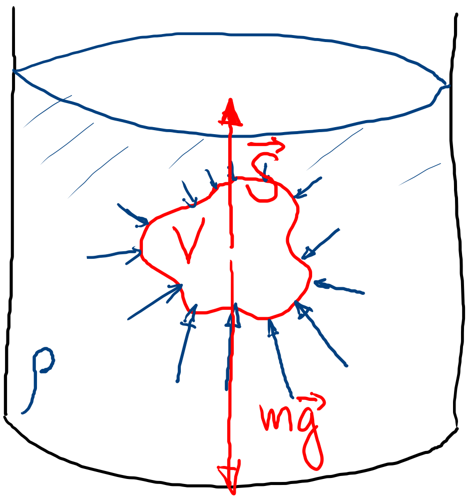
$$m\vec{g} = \Delta S \cdot h \cdot \rho \cdot \vec{g}$$

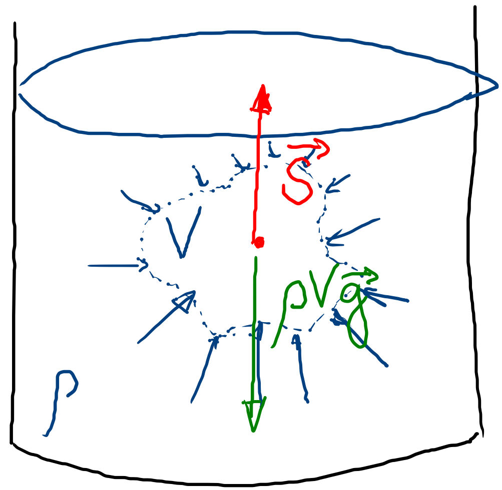
$$\Delta p = \frac{|m\vec{g}|}{\Delta S} = \frac{\Delta S\, h\, \rho |\vec{g}|}{\Delta S}$$

$$\Delta p = \rho g h$$

$$p = p_0 + \rho g h$$

PRINCIPIO DI ARCHIMEDE



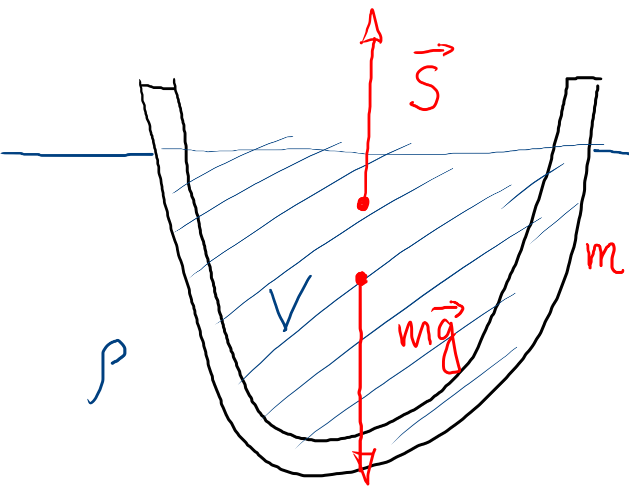


$\vec S$ risultante delle forze dovute alla pressione

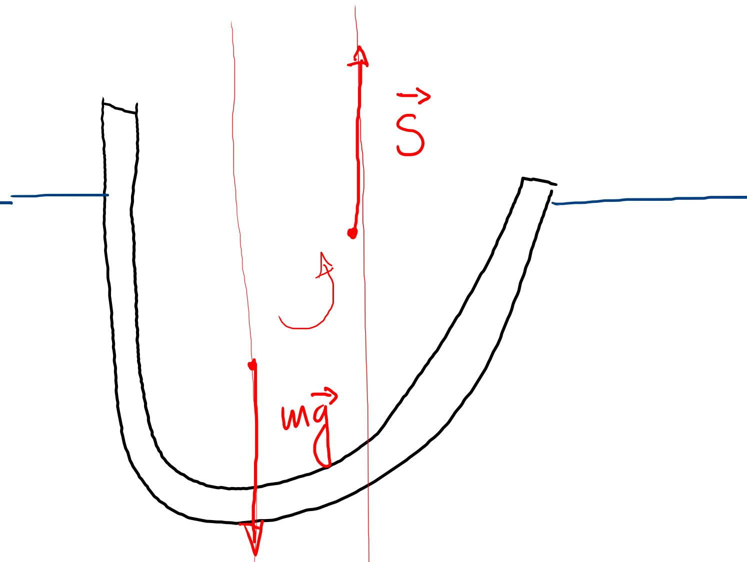
$$\vec S = -\rho V \vec g$$

$\vec{S}$ è applicata nel baricentro del fluido spostato

$m\vec{g}$ " " della barca.

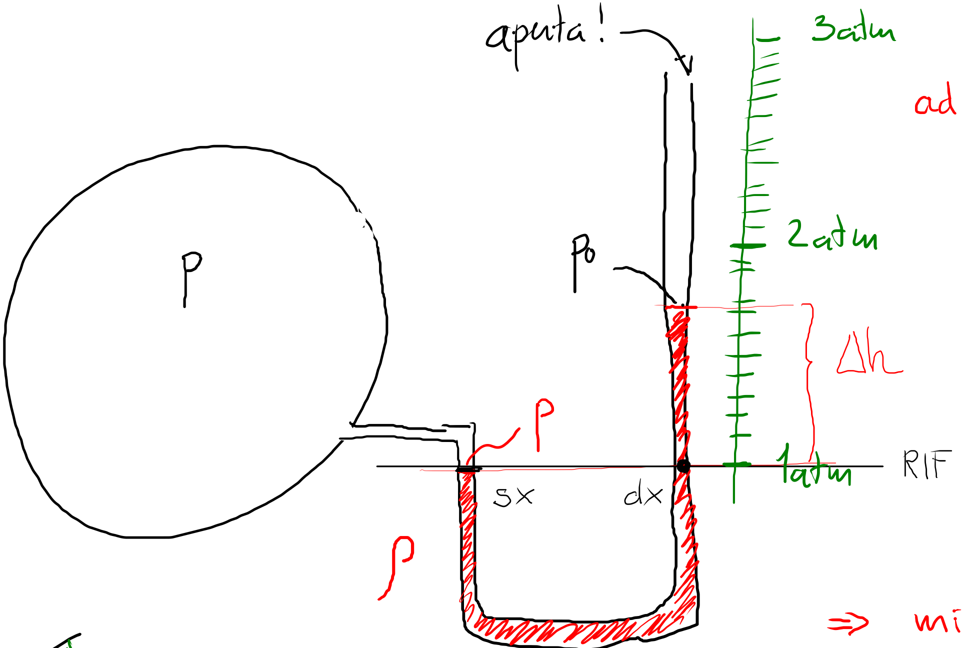


$$\vec{S} = \rho V \vec{g}$$



coppia di forze che tende a raddrizzare la barca

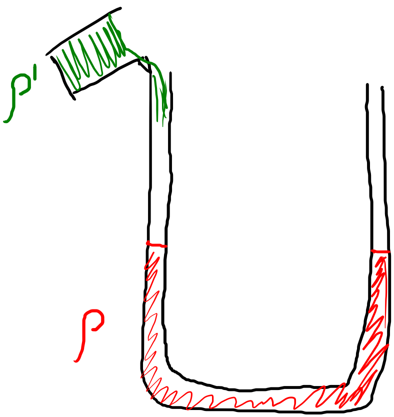
MANOMETRO AD ARIA LIBERA



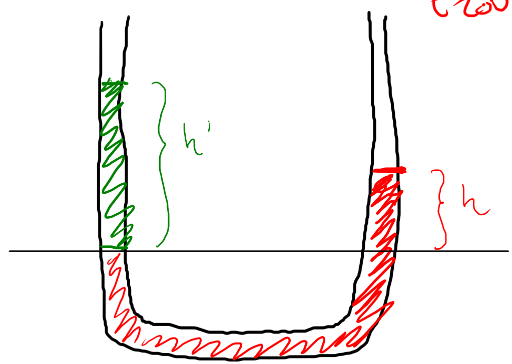
ad. es. $\rho_{Hg} = 13{,}5\ g/cm^3$

$$\overset{sx}{p} = \overset{dx}{p_0 + \rho g \Delta h}$$

$\Rightarrow$ misurando Δh trovo p



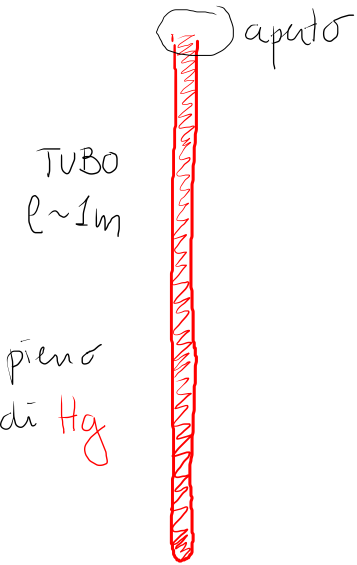
$\rho' < \rho$



$$\rho' \cancel{g} h' = \rho \cancel{g} h$$

$$h = \frac{\rho'}{\rho} h'$$

ESPERIENZA DI TORRICELLI



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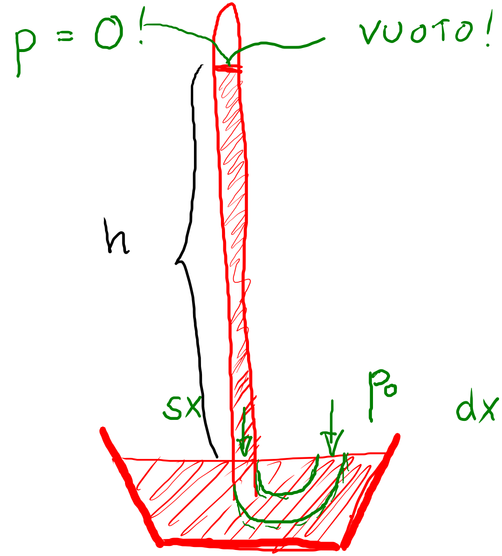


sx = dx

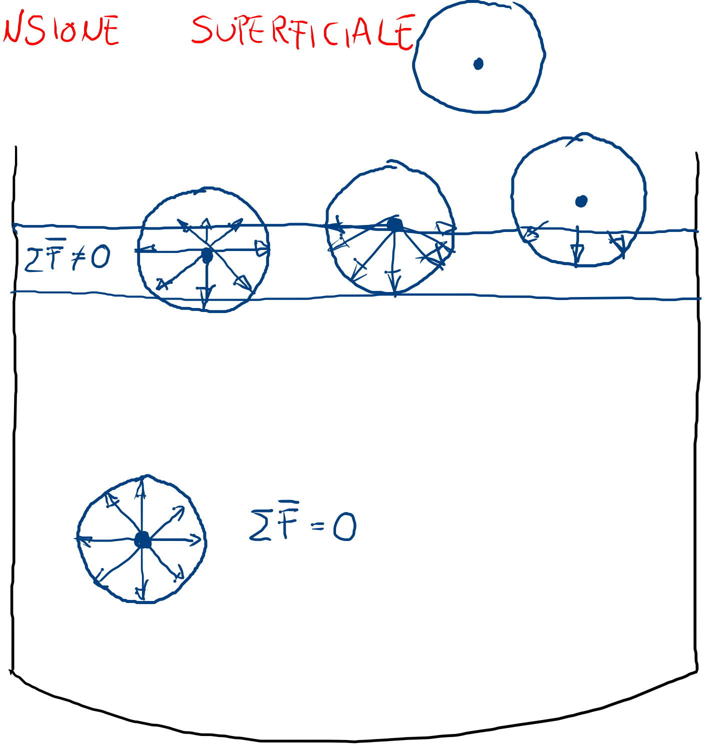
$$0 + \rho g h = p_0$$

1 atm

$$h = 760 \text{ mm}$$

$$760 \text{ mmHg} = 760 \text{ Torr} = 1 \text{ atm}$$

TENSIONE SUPERFICIALE



} forza di richiamo

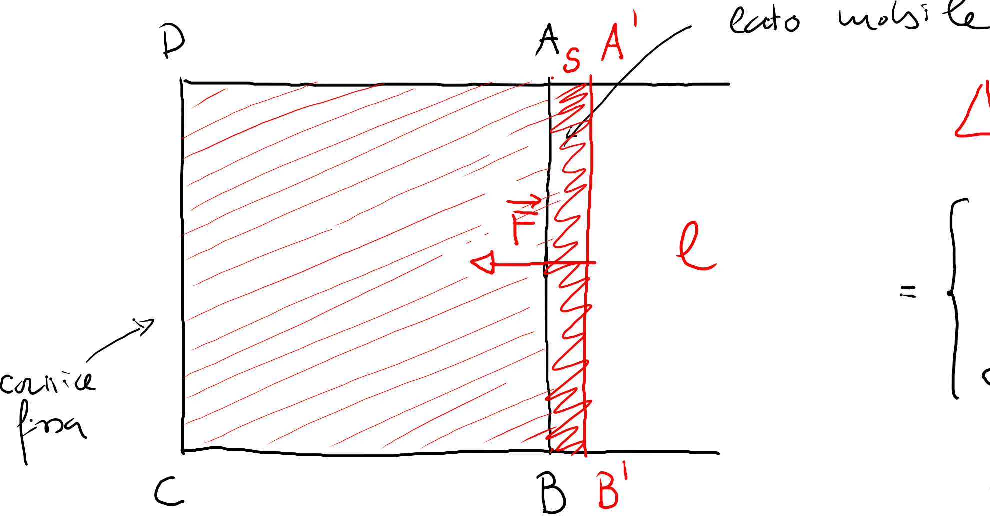
$$\tau = \frac{\mathcal{L}}{\Delta S}$$

← lavoro legato all'aumento di sup. ($\mathcal{L}$)

← aumento di superficie (ΔS)

$$[\tau] = \frac{J}{m^2} = \frac{N}{m}$$

τ è anche forza × unità di lunghezza



perché la lamina ha 2 superfici

$$\Delta S = 2 \cdot s \cdot \ell$$

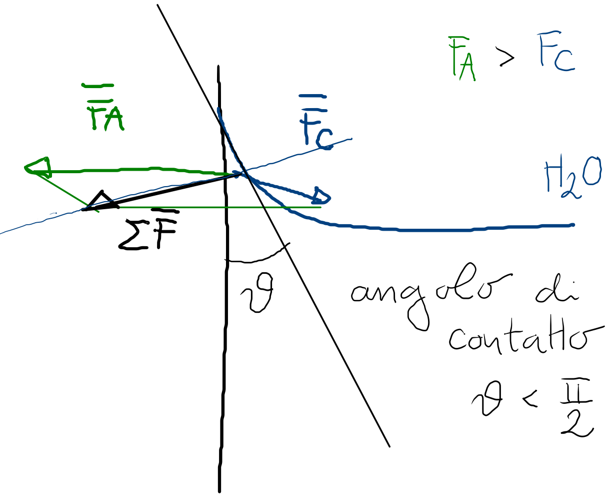
$$= \begin{cases} \mathcal{L} = F \cdot s \\ \mathcal{L} = \tau \cdot \Delta S = \tau \cdot 2 s \ell \end{cases}$$

$$F \cdot \cancel{s} = \tau \cdot 2 \cancel{s} \ell$$

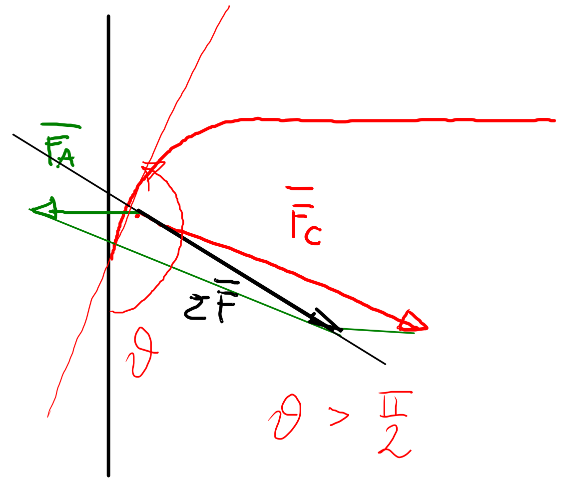
$$F = 2 \cdot \tau \cdot \ell$$

FORZE DI ADESIONE

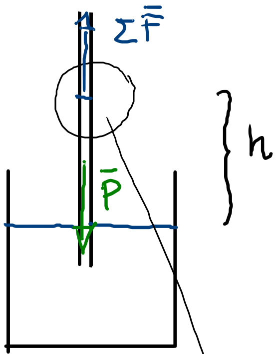
H_2O : l'acqua "bagna" il vetro

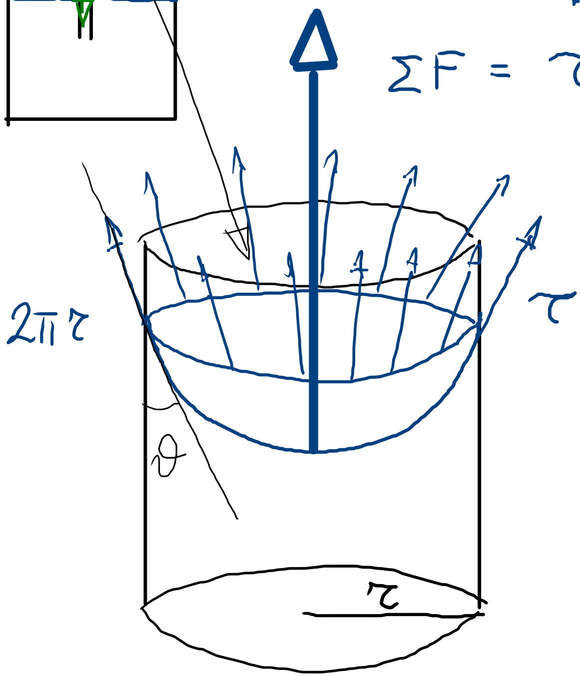


Hg : il mercurio "non bagna" il vetro



FENOMENI CAPILLARI





N/m ↓

$$\Sigma F = \tau \cdot 2\pi r \cos\vartheta$$

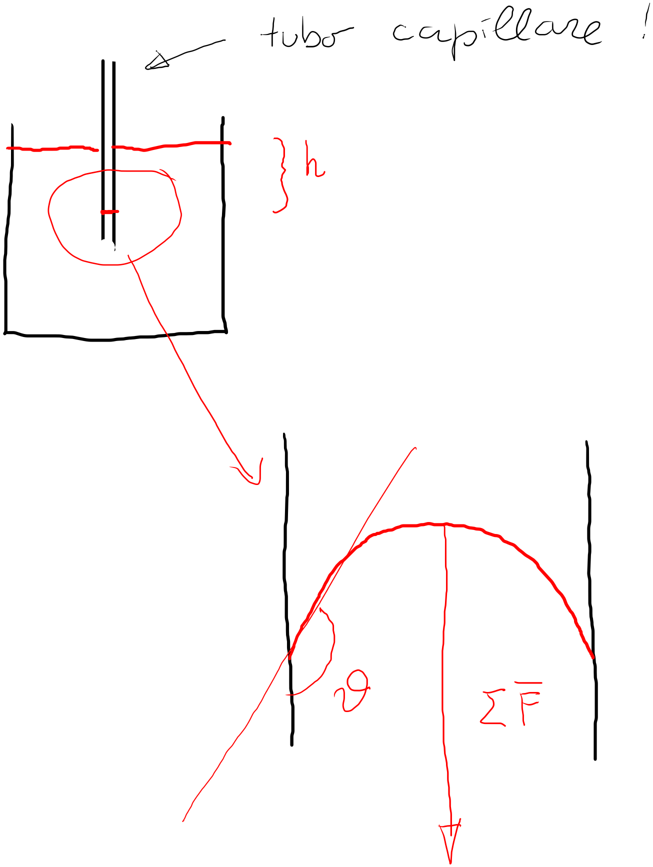
$$P = mg = \rho V g = \rho \pi r^2 \cdot h g$$

$$\Sigma F = P$$

$$\cancel{2\pi r}\, \tau \cos\vartheta = \rho \cancel{\pi} r^{\cancel{2}} h g$$

$$h = \frac{2\tau\cos\vartheta}{r\rho g}$$

Legge di Jurin



Anche nel caso del mercurio vale

$$h = \frac{2\tau \cos\vartheta}{r \rho g}$$