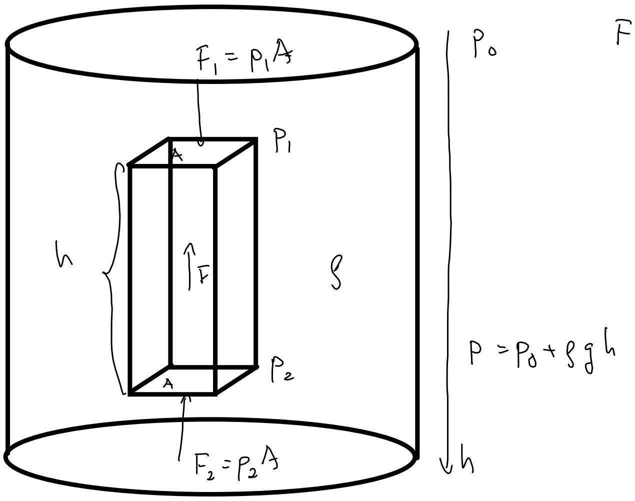
Oppdrift: Arkimedes' lov



$F = F_2 - F_1$

$= (p_2 - p_1) A$, where $p_2 - p_1 = \rho g h$

$= \rho g h A$, where $hA = V$

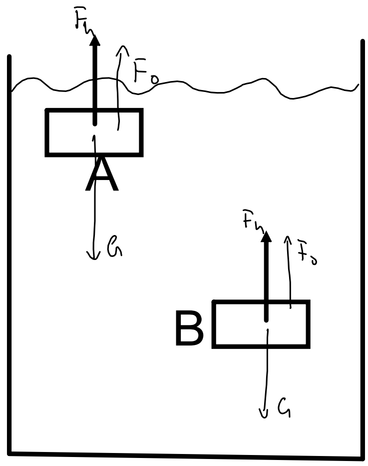
$= \rho V g = m_v g$, where $\rho V = m_v$

Feb 11-11:49 AM

Vi holder to mursteiner under vann. Murstein A er rett under vannflata, mens murstein B er lengre nede. Krafta som trengs for å holde B oppe er

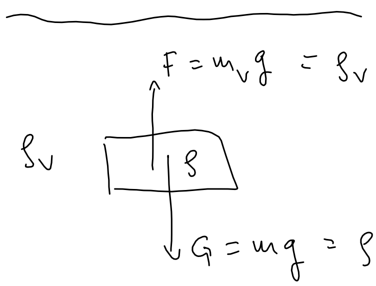
1. større enn
2. lik
3. mindre enn

Krafta som trengs for å holde A oppe.



Feb 11-10:19 AM

Hva bestemmer om noe flyter eller synker?



$F = m_v g = \rho_v V g$

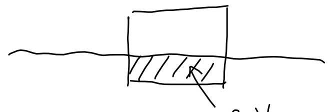
$G = mg = \rho V g$

Synker: $G > F$

$\rho V g > \rho_v V g$

$\rho > \rho_v$

Flyter $\rho < \rho_v$



$\rho_v V_u g = mg$

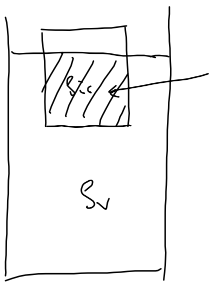
$= \rho V g$

$V_u = V \cdot \frac{\rho}{\rho_v}$

Feb 16-3:20 PM

En isterning flyter i vann i et glass. Når all isen har smeltet, vil da

A. vannivået i glasset ha steget
B. vannivået i glasset ha sunket
C. vannivået i glasset være det samme
D. umulig å avgjøre hva som skjer med vannivået

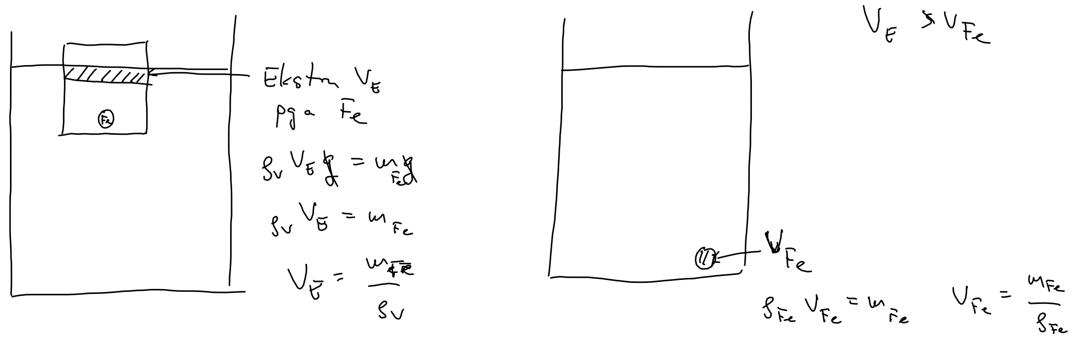


$V_u \rho_v g = m_{is} g$

Feb 11-10:50 AM

En isterning flyter i vann i et glass.
Isterningen inneholder noen småbiter av jern.
Når all isen har smeltet, vil da

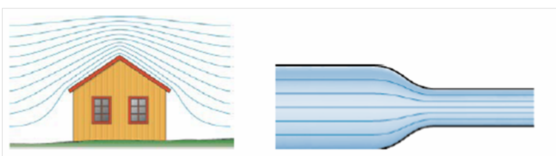
A. vannivået i glasset ha steget
B. vannivået i glasset ha sunket
C. vannivået i glasset være det samme
D. umulig å avgjøre hva som skjer med vannivået

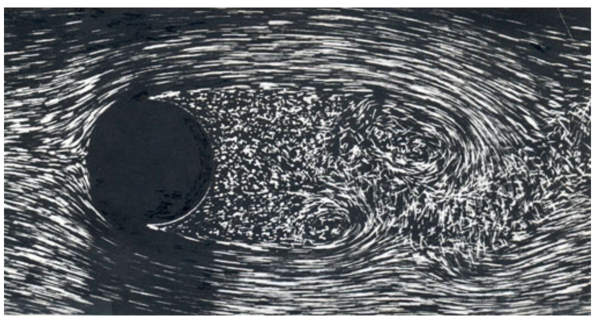


Feb 11-10:50 AM

Fluiddynamikk og strømlinjer

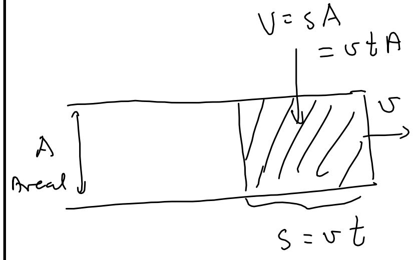
- Bevegelsen til en tenkt væskepartikkel
- Fartvektoren tangent til strømlinjen (som i posisjonsgraf
- Strømlinjene ligger tettere der væsken har høyere fart





feb 16-09:45

Volumstrøm

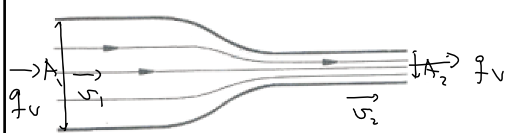


$$q_V = \text{Volumstrøm} = \frac{\text{Volum}}{\text{tid}} = \frac{V}{t} = \frac{v\,t\,A}{t}$$

$$= vA$$

Feb 17-9:46 AM

Kontinuitetslikningen

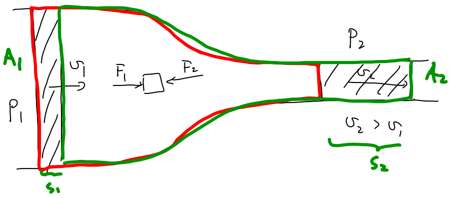


$$q_V = A_1 v_1 = A_2 v_2$$

$$v_2 = v_1 \cdot \frac{A_1}{A_2}$$

Feb 13-1:15 PM

Bernoullis lov



$v_2 > v_1 \Rightarrow F_1 > F_2$

$\Rightarrow p_1 > p_2$

$W_1 = F_1 s_1 = p_1 A_1 s_1$

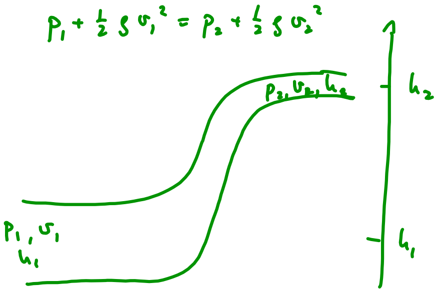
$W_2 = F_2 s_2 = p_2 A_2 s_2$

$W = W_1 - W_2 = p_1 \underbrace{A_1 s_1}_{V} - p_2 \underbrace{A_2 s_2}_{V} = (p_1 - p_2)V$

$\Delta E_k = \frac{1}{2} m (v_2^2 - v_1^2) = \frac{1}{2} \rho V (v_2^2 - v_1^2) = W$ ($m = \rho V$)

$\frac{1}{2} \rho V (v_2^2 - v_1^2) = (p_1 - p_2) V$

$p_1 + \frac{1}{2} \rho v_1^2 = p_2 + \frac{1}{2} \rho v_2^2$



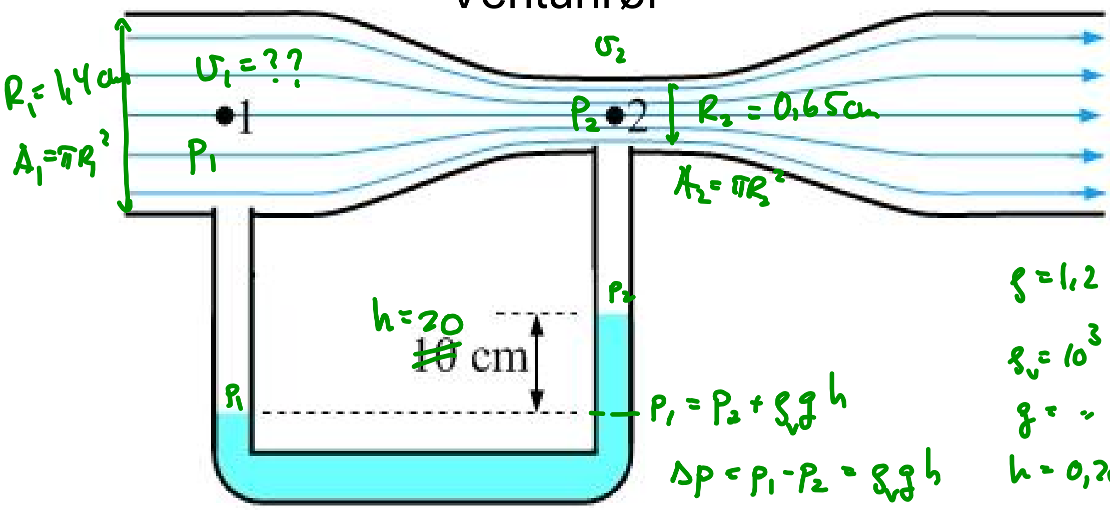
$p_1 + \rho g h_1 + \frac{1}{2} \rho v_1^2 = p_2 + \rho g h_2 + \frac{1}{2} \rho v_2^2$

$v_1 = v_2 = 0$: $p_1 + \rho g h_1 = p_2 + \rho g h_2$

$p_1 = p_2 + \rho g \underbrace{(h_2 - h_1)}_{h}$

Feb 13-1:15 PM

Venturirør



$p_1 = p_2 + \rho_v g h$

$\Delta p = p_1 - p_2 = \rho_v g h$

$\rho = 1,2$ kg/m³

$\rho_v = 10^3$ kg/m³

$g = $ ..

$h = 0,20$ m

Bernoulli: $p_1 + \frac{1}{2} \rho v_1^2 = p_2 + \frac{1}{2} \rho v_2^2$

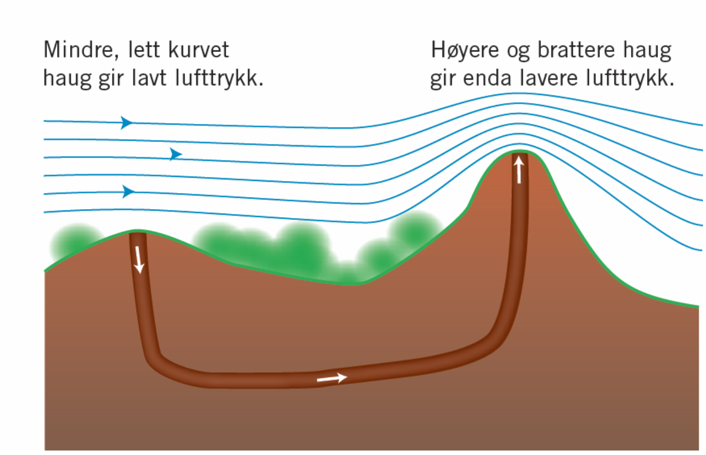
$\Delta p = p_1 - p_2 = \frac{1}{2} \rho (v_2^2 - v_1^2) = \frac{1}{2} \rho (4,64^2 v_1^2 - v_1^2) = \frac{1}{2} \rho v_1^2 (4,64^2 - 1)$

Kont: $A_1 v_1 = A_2 v_2 \Rightarrow v_2 = v_1 \frac{A_1}{A_2} = v_1 \cdot \frac{\pi R_1^2}{\pi R_2^2} = v_1 \cdot 4,64$

$v_1 = \sqrt{\frac{2 \Delta p}{\rho (4,64^2 - 1)}} = \text{- - - -}$

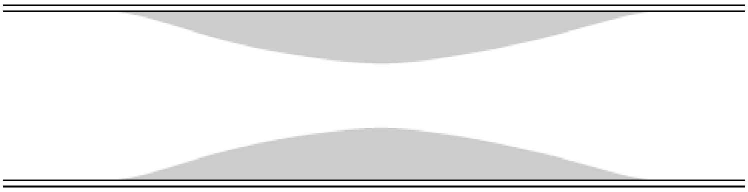
Feb 15-12:16 PM

Præriehundens hule



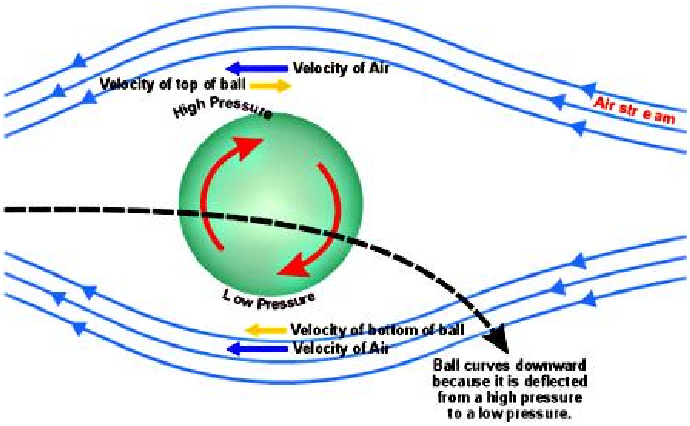
Feb 15-12:58 PM

Arteriosklerose



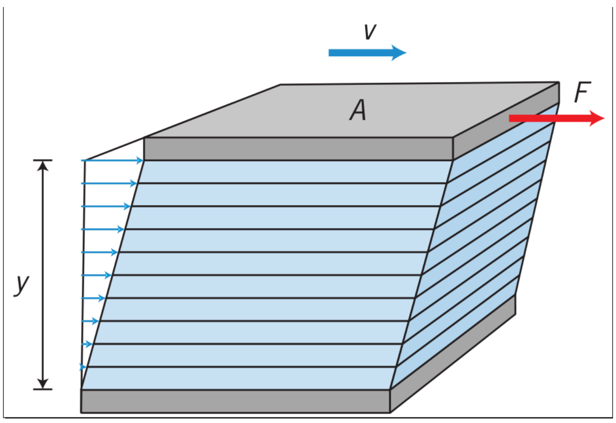
Feb 15-12:28 PM

Magnuseffekt



Feb 15-12:46 PM

Viskositet



	$T/°C$	η/Pas
Hydrogen	20	$8{,}4 \cdot 10^{-6}$
Luft	0	$17 \cdot 10^{-6}$
	20	$18 \cdot 10^{-6}$
	100	$22 \cdot 10^{-6}$
Etanol	20	0,00012
Vann	0	0,0018
	20	0,0010
	100	0,00028
Blod	37	0,0025
Smøreolje	0	5,3
	20	0,99
	100	0,017
Glass	400	10^{12}

$F = \eta A \frac{v}{y}$

↑viskositet

$\eta = \frac{Fy}{Av} = \frac{Nm}{m^2 m/s} = Pa\,s$

Feb 11-3:55 PM

Will Humans Swim Faster or Slower in Syrup?

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AIChE Journal November 2004 Vol. 50, No. 11

we wondered whether swimmers would go faster or slower if the viscosity of the fluid was increased.

We discussed this with our colleagues, but found no consensus. Most, including some who were experts in fluid mechanics, felt that the swimmers would go more slowly. Some said the swimmers would go faster, because of increased drag on the hands. A few suggested that there would be no change.

Feb 13-2:18 PM

We slowly poured 310 kg of guar (Aqualon Supercol, Hercules Chemical, Wilmington, DE) into a 0.15 m^3 garbage can stirred with 1 kW motor through which pool water was pumped at a rate of about 0.01 m^3/s. The resulting dispersion flowed into a 650 m^3 swimming pool, where it was stirred for 36 h with three submersible pumps, each moving at least 0.05 m^3/s. After this mixing, the viscosity of the aqueous guar solution was $(1.92 \pm 0.05)\ 10^{-3}$ Pa s, or about twice that of water. This viscosity did not vary over 16 different positions in the pool. Because the viscosity at this dilute concentration (0.05%) is Newtonian, it gave the same readings in several capillary viscometers and with different spindles of a Brookfield viscometer. The density of these guar solutions was within 10^{-4} g/cm^3 of that of water, so buoyancy changes were insignificant.

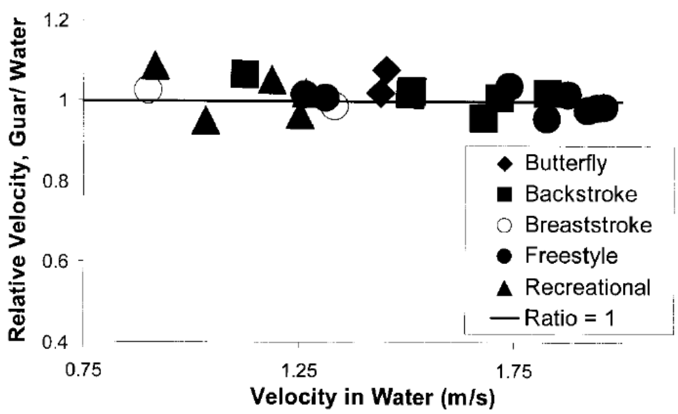


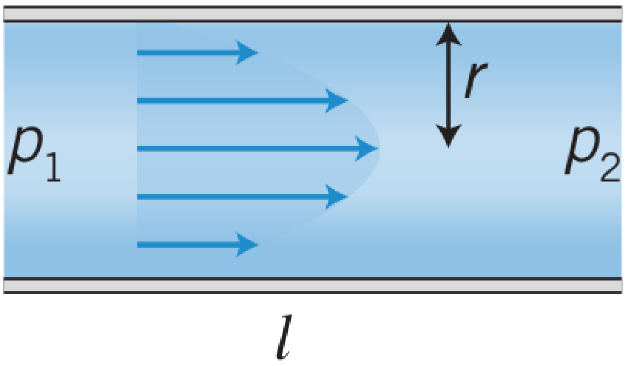
Figure 1. Swimming speed in guar solution is the same as in water.

Feb 13-2:33 PM

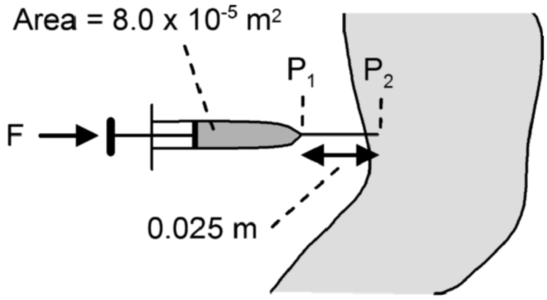
Strømning av viskøs væske i et rør

$$\Delta p = p_2 - p_1$$

$$q_v = \frac{\pi r^4 \Delta p}{8 \eta l}$$



Feb 11-3:59 PM

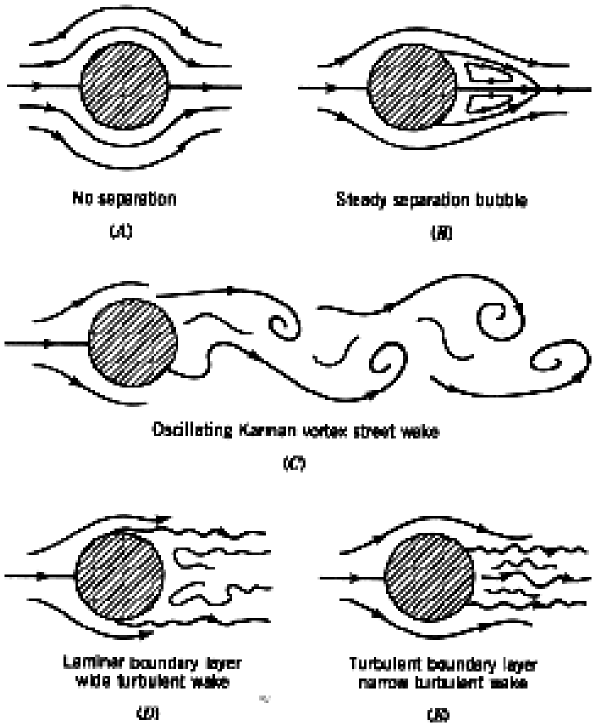


$r = 4 \cdot 10^{-4}$ m
$l = 0{,}025$ m
$V = 1\text{mL} = 1 \cdot 10^{-6}$ L
$t = 3$ s
$h = 1{,}5 \cdot 10^{-3}$ Pas
$p_2 = 14$ mmHg
$= 1900$ Pa (overtrykk)
$p_1 = ????$
$F = ????$

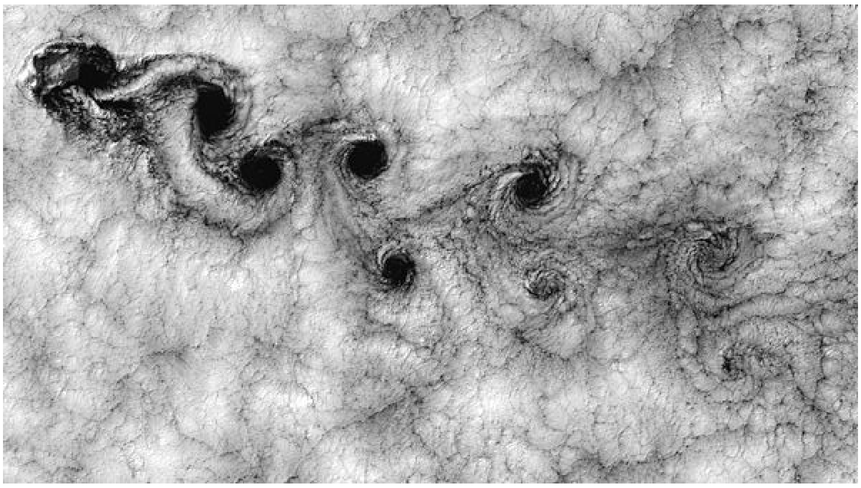
Feb 13-2:00 PM

Laminær og turbulent strøming

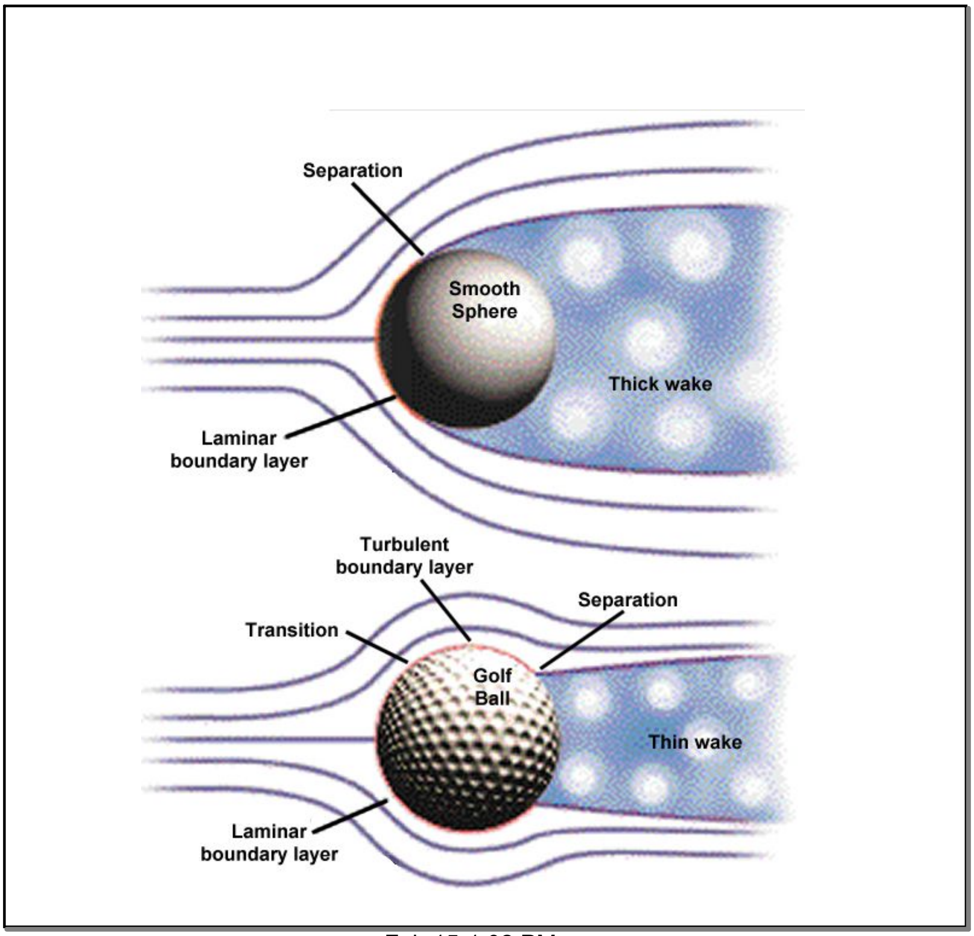
Re = (A) 0.2; (B) 12; (C) 120; (D) 30,000; (E) 500,000.



Feb 7-2:41 PM



Feb 15-1:02 PM



Feb 15-1:02 PM

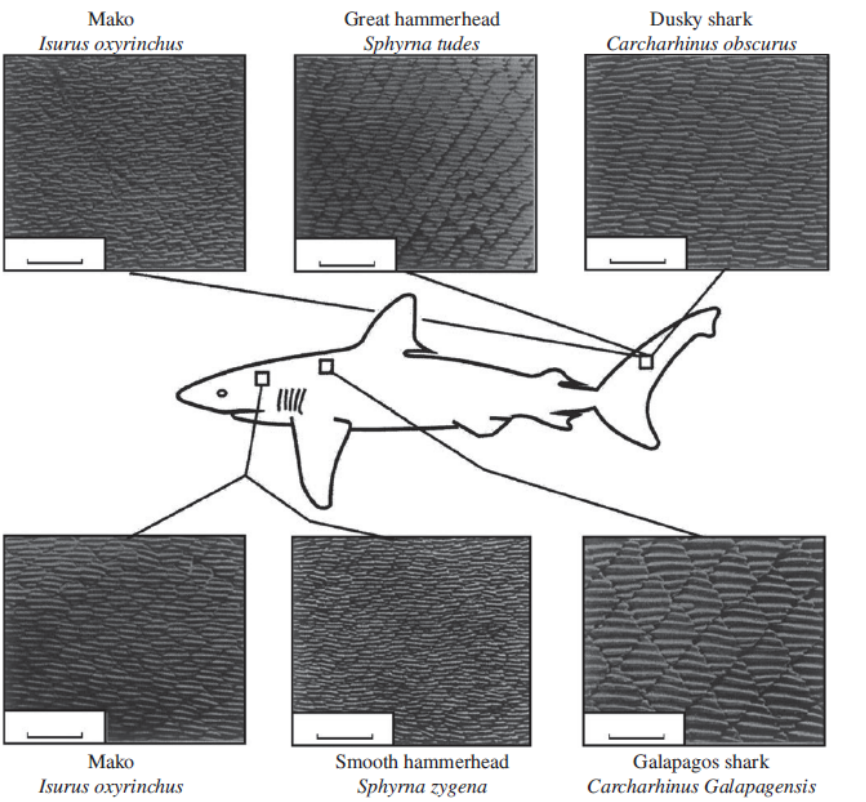
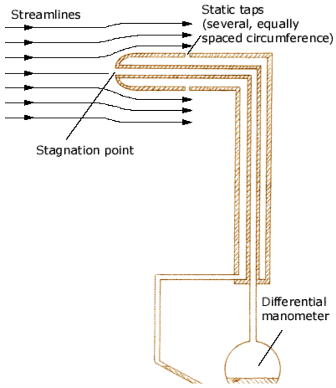


Figure 1. Scale patterns on fast-swimming sharks (adapted from Reif 1985; Bechert *et al.* 2000*a*; scale bar, 0.5 mm).

Feb 15-1:12 PM

Pitotrør



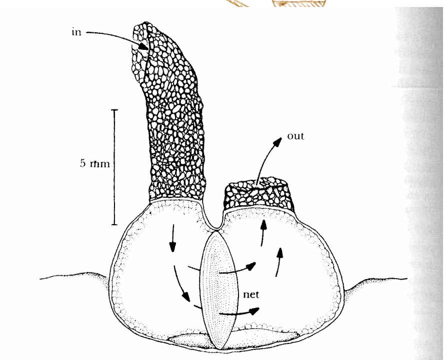
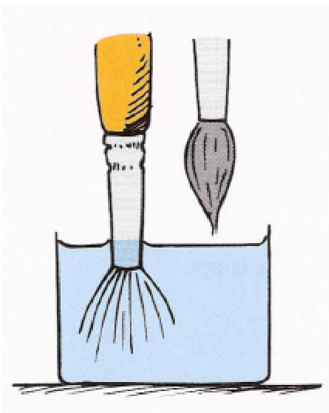
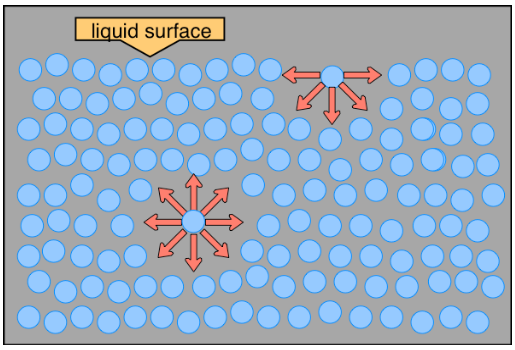


FIGURE 7.4. The Pitot tube and static orifice of the larva of the caddisfly *Macronema*. The animal lives in a small pipe that bypasses the silken catch-net and that has been omitted here.

feb 16-11:01

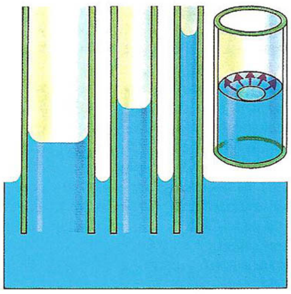
Overflatespenning

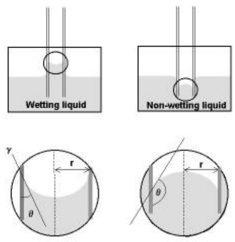


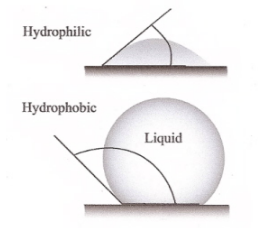


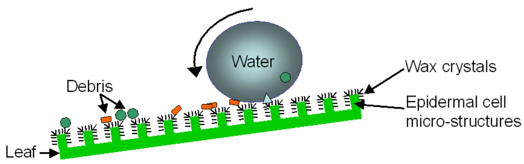
Feb 13-1:16 PM

Kapillarrør, hydrofobe of hydrofile overflater









Feb 18-1:49 PM

Feb 11-8:44 AM