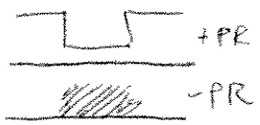
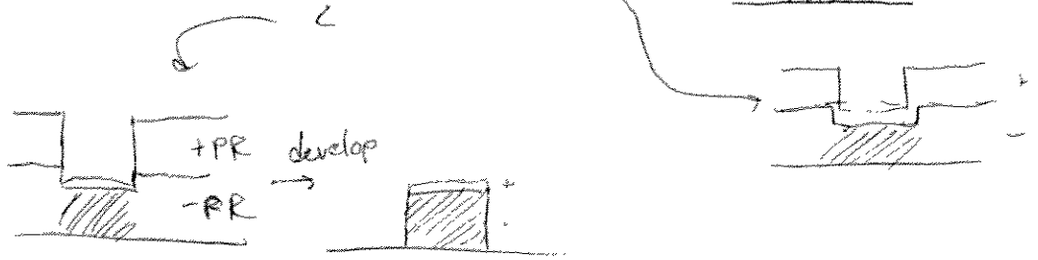
Discussion 9/27

① Lithography. (HW2 solutions)

Underexposure: need to assume which degrades more: +PR or -PR

- remaining +PR > degraded -PR → 



Overexposure:

Footing (backscatter): 

Diffraction.

different angles due to diffraction

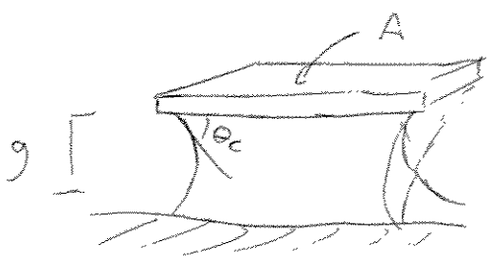
→ stays same post development

distance

See HW2 solutions for more detailed discussion.

Discussion 9/27

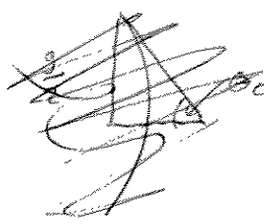
① Stiction Derivation. (clark's notes)

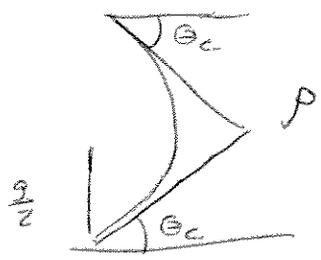


imagine a curved wet surface spherical, radius of curvature ρ

Young-Laplace: $\Delta P = \gamma \cdot \frac{2}{\rho}$

Need to express radius of curvature in terms of g, θ_c:





$\rho = \frac{g/2}{\cos\theta_c}$

$\downarrow$

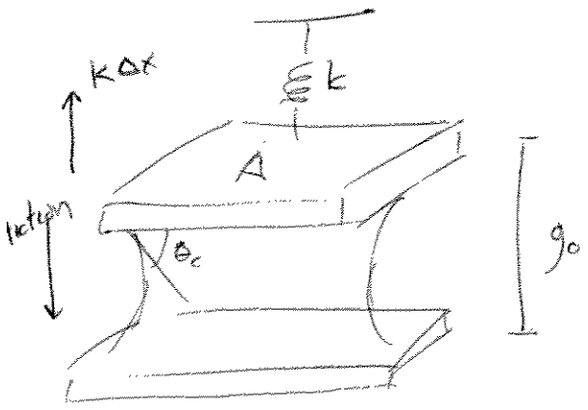
$\cos\theta_c = \frac{g/2}{\rho} \rightarrow$

$F = \Delta P \cdot A$

$= \frac{\gamma}{r} \cdot A$

$= \frac{2A\gamma \cdot \cos\theta_c}{g}$

② Solving a stiction problem.



~~Stiction force~~

we solve by assuming some equilibrium displacement and then solve for that displacement. If we do not get a sensible result ($\Delta x < 0$ or $\Delta x > g$ or Δx not real) then we contradict our assumption.

So if stiction force is normally $F = \frac{2A\gamma_{LA}\cos\theta_c}{g_0}$

then after displacing downward by Δx it is $F = \frac{2A\gamma_{LA}\cos\theta_c}{g_0 - \Delta x}$

Ignoring gravity, we set this force equal to a restoring spring force $F = k\Delta x$.

The resultant equation is a quadratic: $k\Delta x = \frac{2A\gamma_{LA}\cos\theta_c}{g_0 - \Delta x}$

$\downarrow$

$$-k(\Delta x)^2 + kg_0\Delta x - 2A\gamma_{LA}\cos\theta_c = 0$$

The discriminant $b^2 - 4ac$ immediately tells us whether stiction will occur.

Still need to solve for Δx: $\Delta x = \frac{g_0}{2} \pm \frac{1}{2k}\sqrt{k^2 g_0^2 - 8kA\gamma_{LA}\cos\theta_c}$

we can see solutions are symmetric around halfway point $\frac{g_0}{2}$.