Lecture 26: Sensing Circuits

- Announcements:
- Reminder: 3rd project slide due Dec. 3
- Project Outbrief Signup Sheet will be on my door tomorrow (Friday)
  - All outbriefs will be on Monday, Dec. 13
- Final Review Session:
  - Tuesday, December 7, 5-7 pm?
  - Thursday, December 9, 5-7 pm?
  - Monday, December 13, 5-7 pm?
  - Wednesday, December 15, 5-7 pm? ←
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- Reading: Senturia, Chpt. 14
- Lecture Topics:
  - Detection Circuits
    - Velocity Sensing
    - Position Sensing
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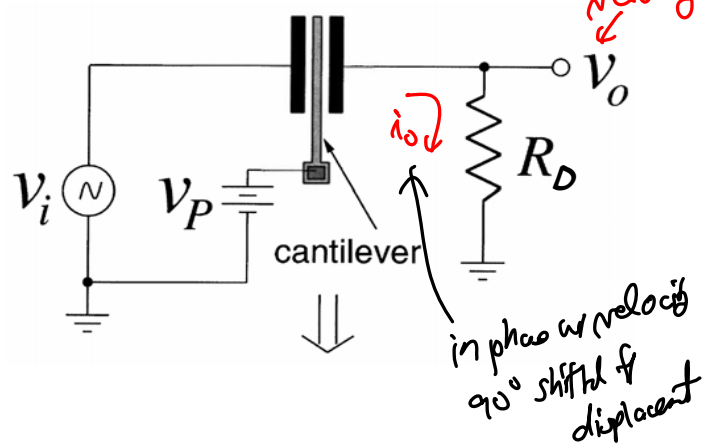
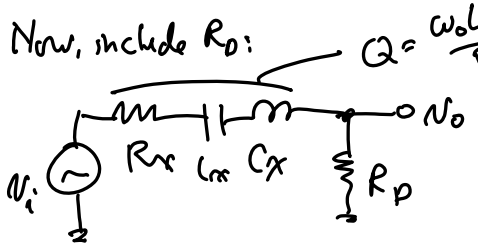
- Last Time: Velocity-to-Voltage Conversion



Now, include R_D: $Q = \frac{\omega_o L_x}{R_x}$



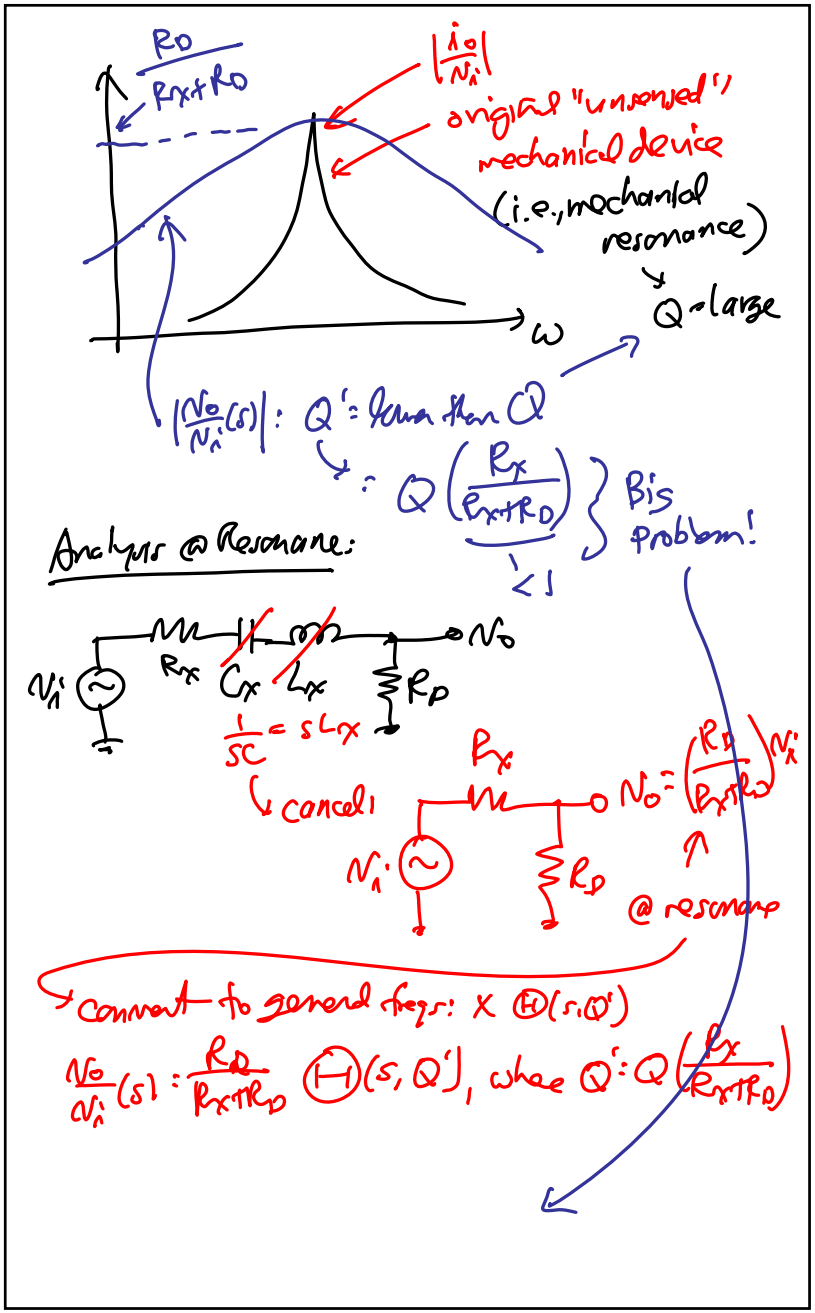
$$\frac{v_o}{v_i}(s) = \frac{R_D}{R_x + \frac{1}{sC_x} + sL_x + R_D} = \cdots \text{math} \cdots$$

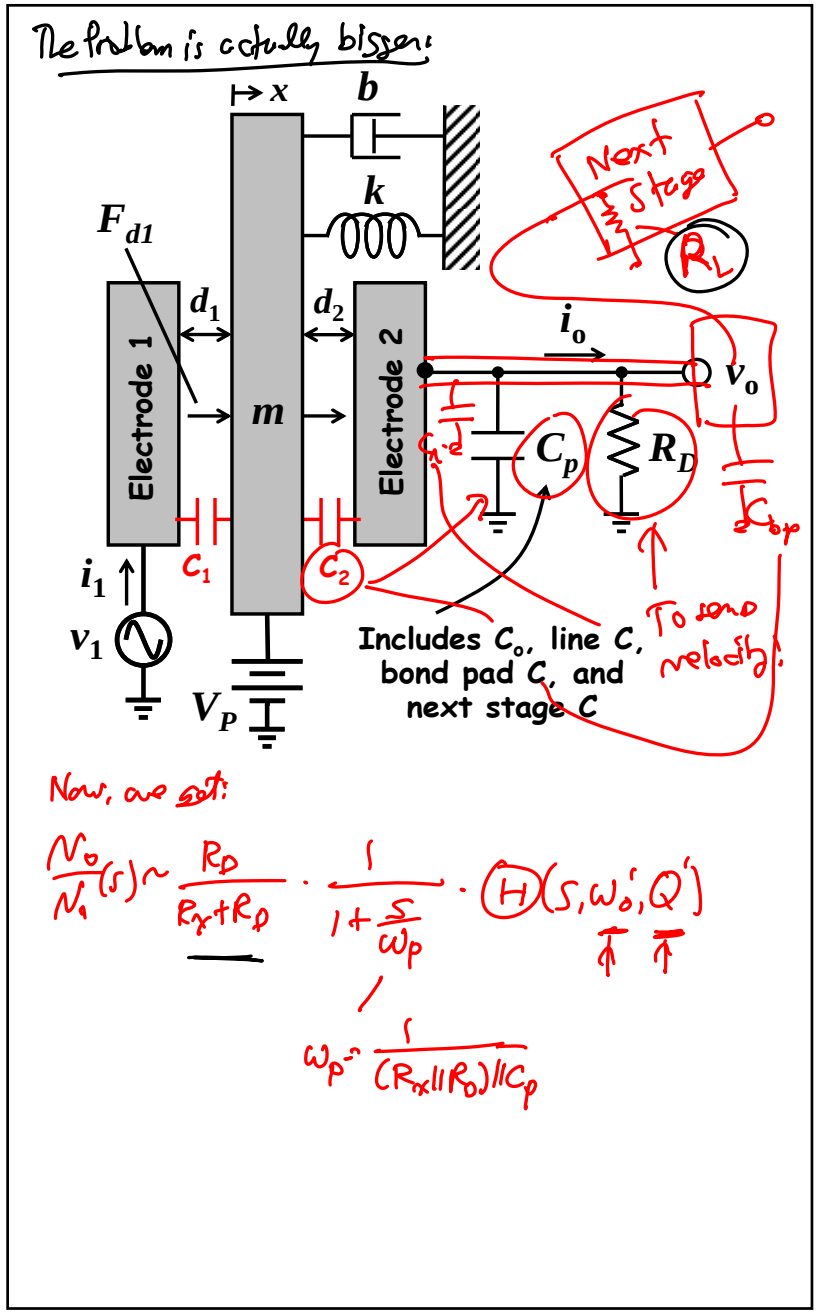
$$= \underbrace{\frac{R_D}{R_x + R_D}}_{\text{Gain Term}} \cdot \underbrace{\frac{s\left(\frac{R_x + R_D}{L_x}\right)}{s^2 + s\left(\frac{R_x + R_D}{L_x}\right) + \frac{1}{L_x C_x}}}_{\text{Freq. Shaping Term}}$$

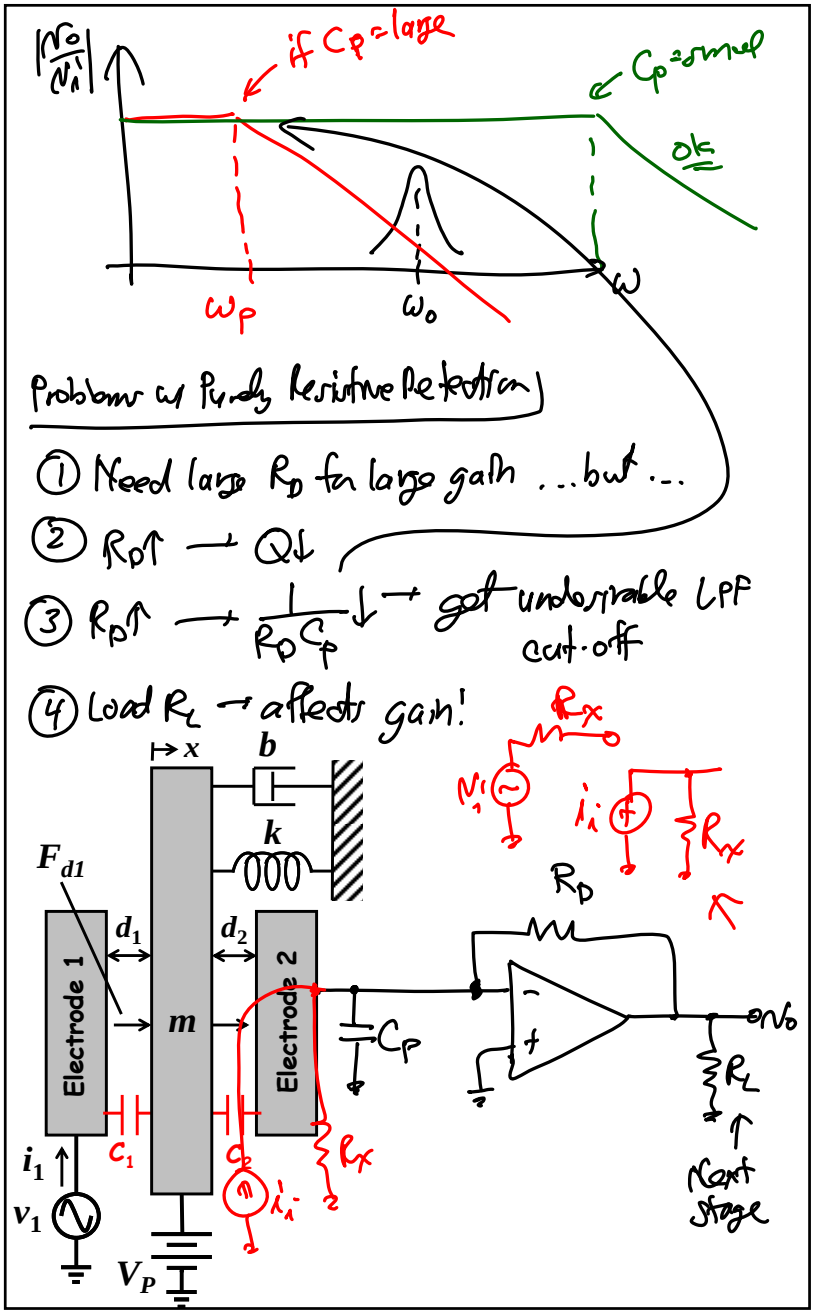
$$\left[Q = \frac{\omega_o L_x}{R_x} \rightarrow Q' = \frac{\omega_o L_x}{R_x + R_D} \rightarrow \frac{R_x + R_D}{L_x} = \frac{\omega_o}{Q'} \right]$$

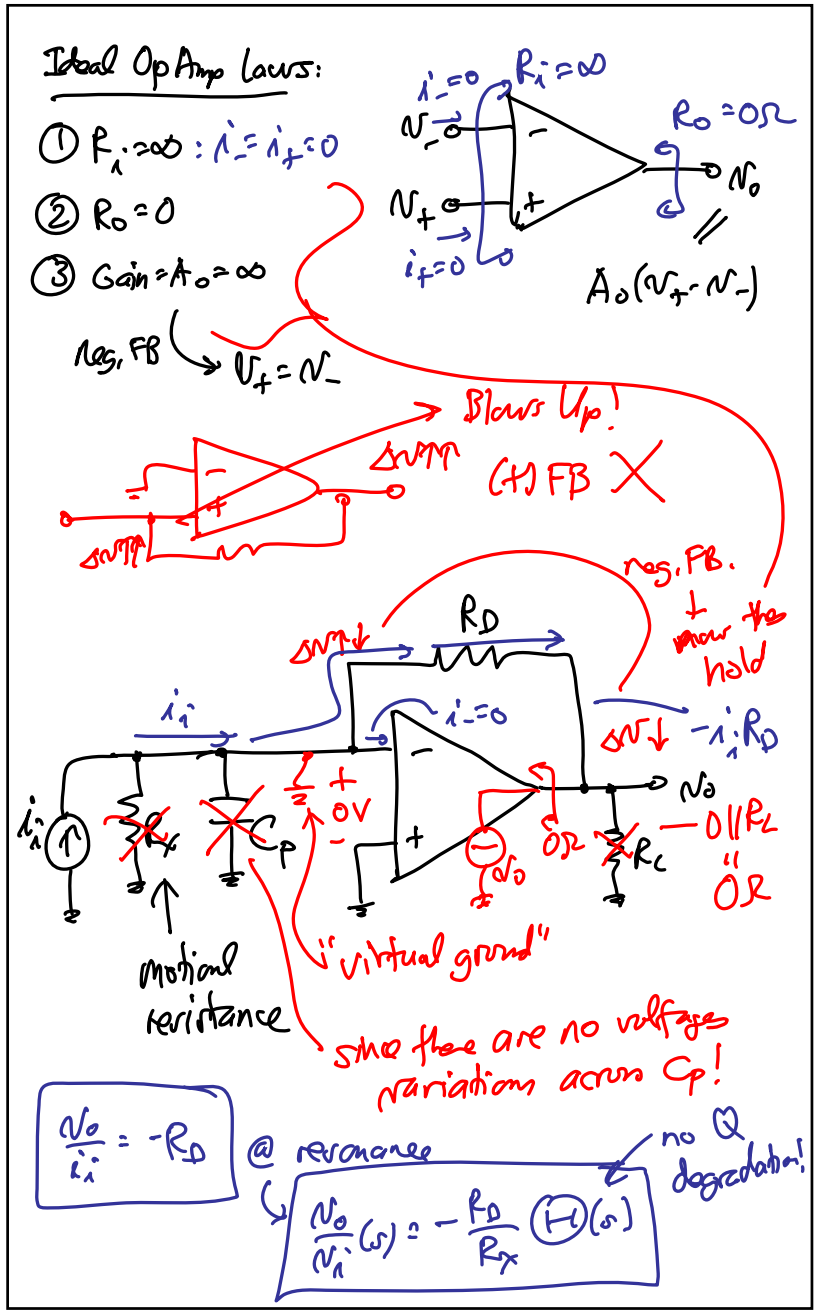
$$\frac{v_o}{v_i}(s) = \frac{R_D}{R_x + R_D} \cdot \frac{s(\omega_o/Q')}{s^2 + s(\omega_o/Q') + \omega_o^2}$$

$$\frac{v_o}{v_i}(s) = \frac{R_D}{R_x + R_D} \cdot H(s; Q') \qquad Q' = Q\left(\frac{R_x}{R_x + R_D}\right)$$









- Go through Module 14 on Sensing Circuits, slides 6-7 and 13-20