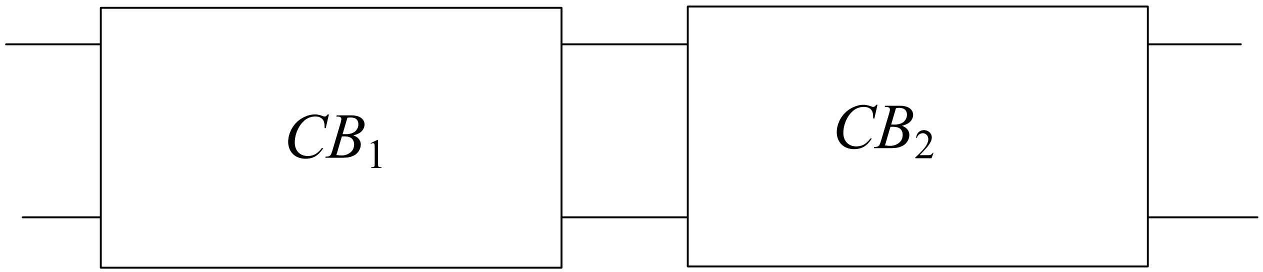
Lecture 34

- Last time:
  - Improved current sources and current mirrors
  - Start multistage amplifiers
- Today :
  - More examples of cascades
  - DC coupling issues

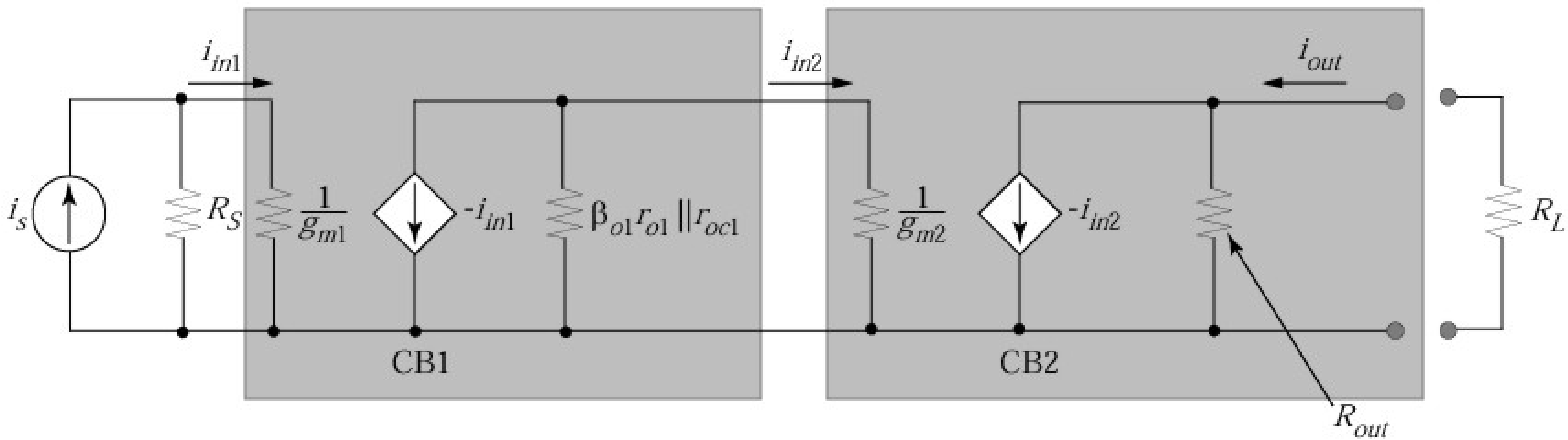
Multistage Current Buffers

Are two cascaded common-base stages better than one?



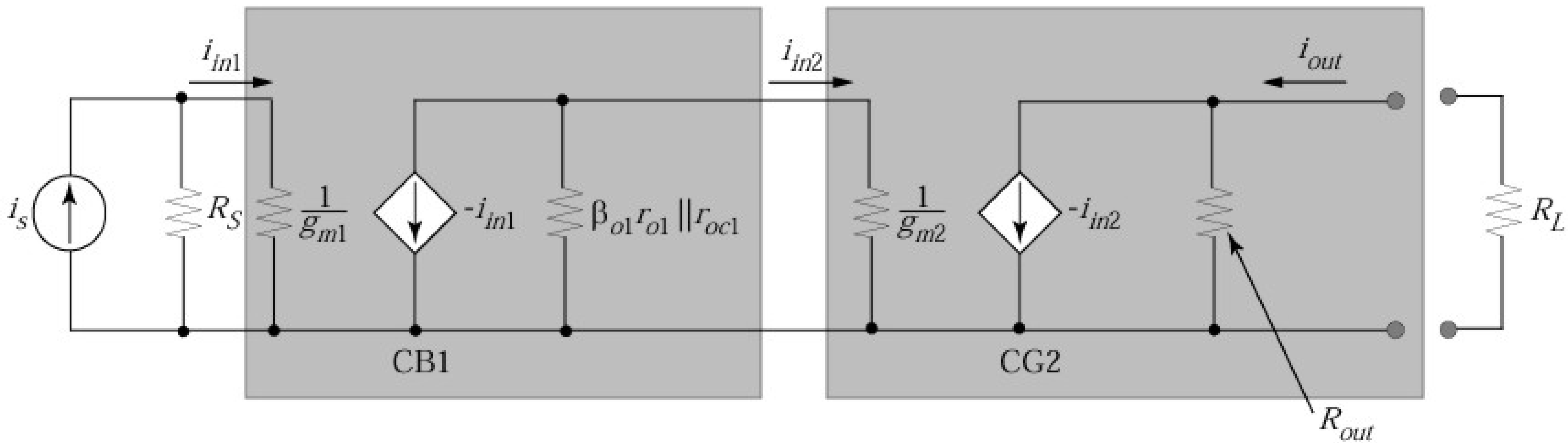
Input resistance: $R_{in} = R_{in1}$

Two-Port Models



$$R_{out} = R_{out2} \cong r_{02}\left(1 + g_{m2} r_{\pi 2} \| R_{S2}\right) \| r_{oc2}$$

Common-Gate 2nd Stage



$$R_{out} = R_{out2} \cong r_{02}\left(1 + g_{m2}R_{S2}\right) \| \, r_{oc2}$$

Summary of Cascaded Amplifiers

General goals:

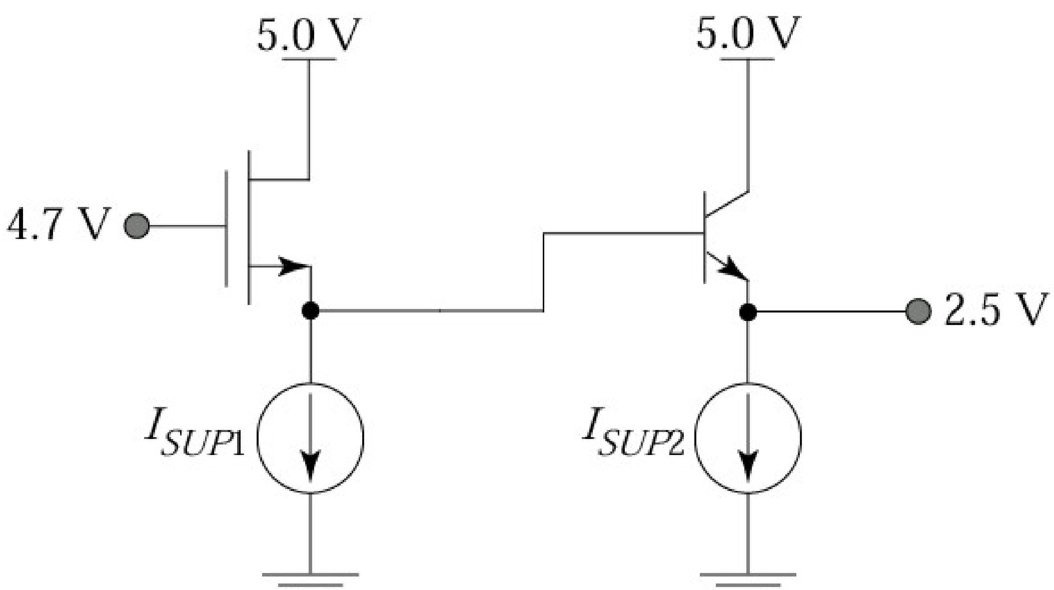
1. Boost the gain parameter (except for buffers)
2. Optimize the input and output resistances

	R_{in}	R_{out}
Voltage:		
Current:		
Transconductance:		
Transresistance:		

Second Design Issue: DC Coupling

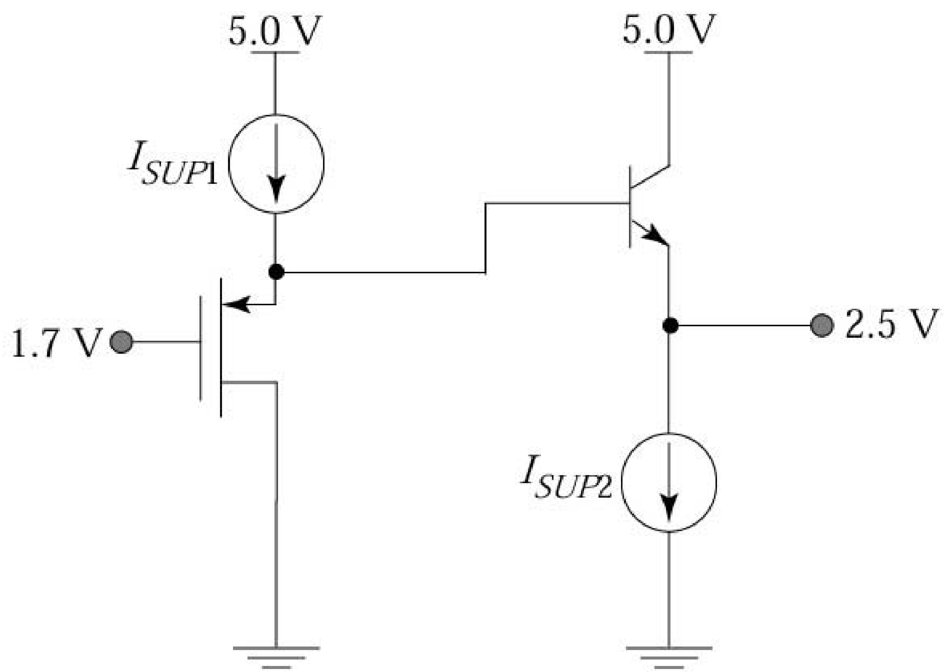
Constraint: large inductors and capacitors are not available

Output of one stage is directly connected to the input of the next stage → must consider DC levels … why?



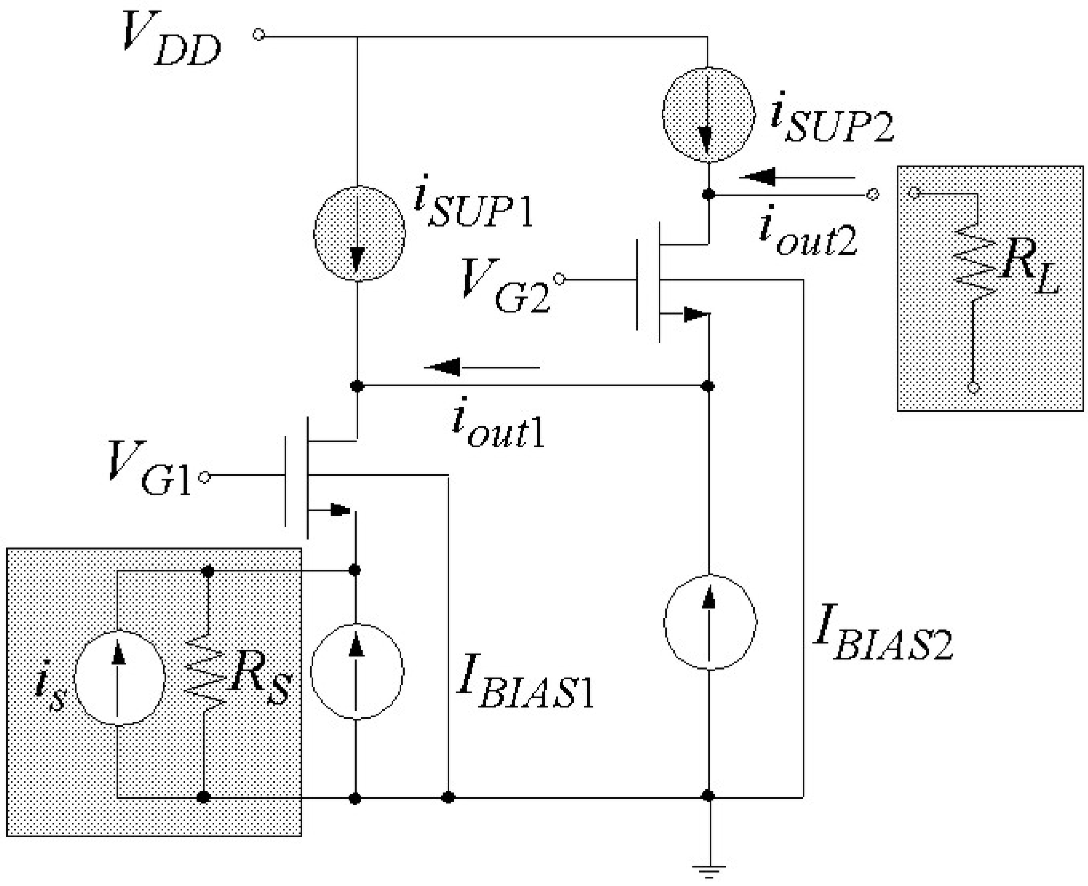
Alternative CG-CC Cascade

Use a PMOS CD Stage: DC level shifts upward



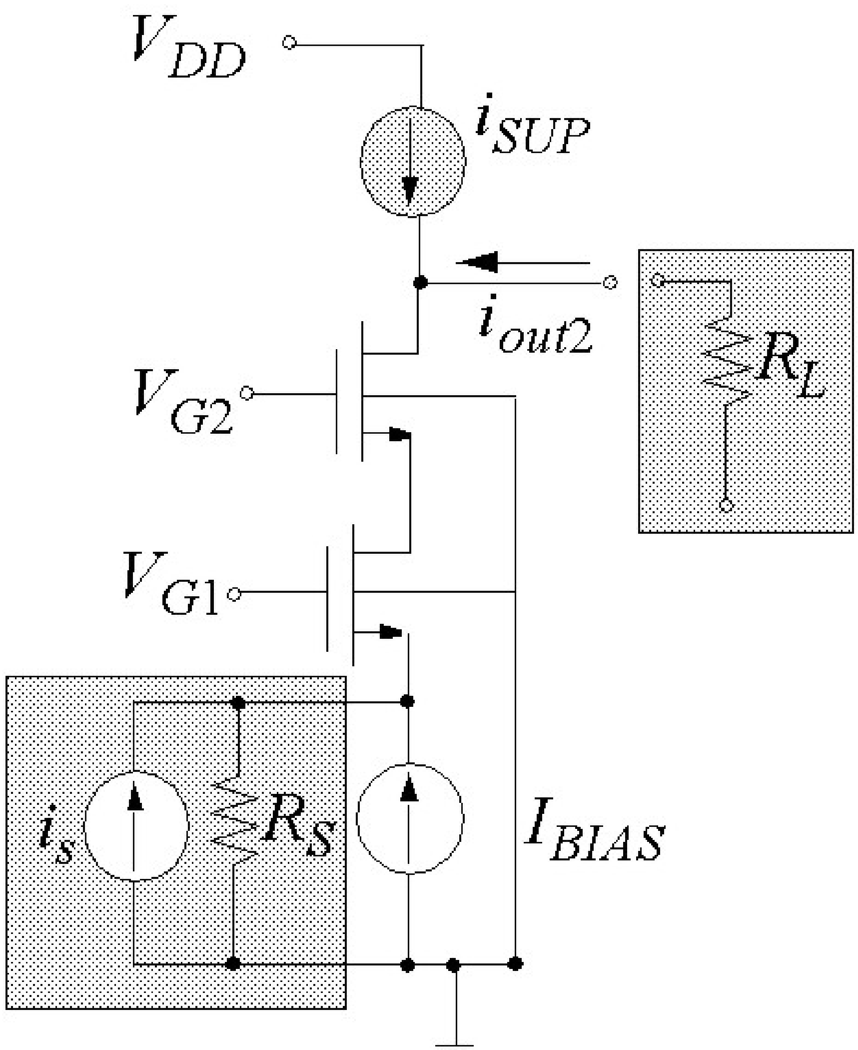
CG Cascade: DC Biasing

Two stages can have different supply currents



Extreme case:
$I_{BIAS2} = 0$ A

CG Cascade: Sharing a Supply



First stage has no current supply of its own → its output resistance is modified

Two-Port Model of Common-Gate Cascade with Shared Current Supply