# Dense Dielectrics

Clausius-Mossotti equation
Boundary Conditions on
**D** and **E**

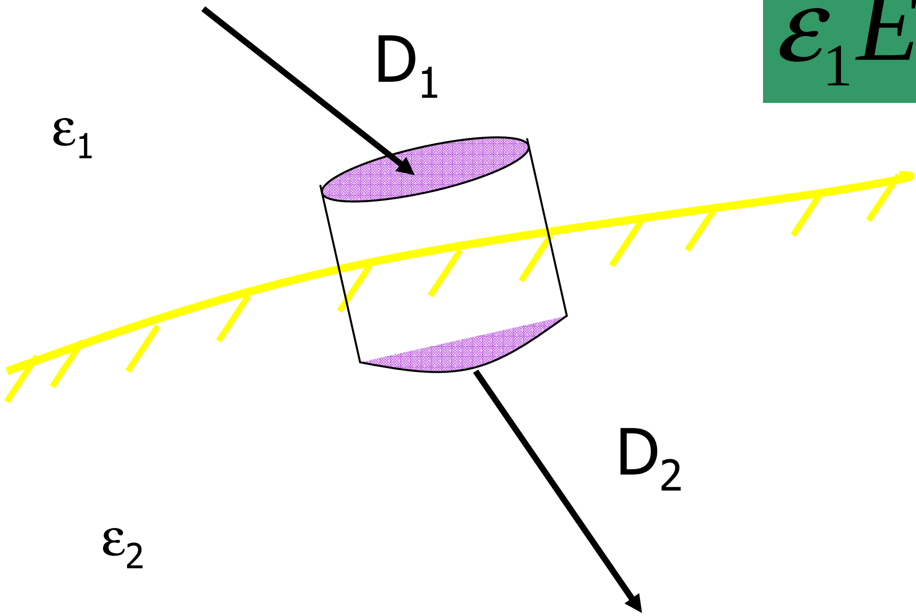
Static Fields for **D** and **E**

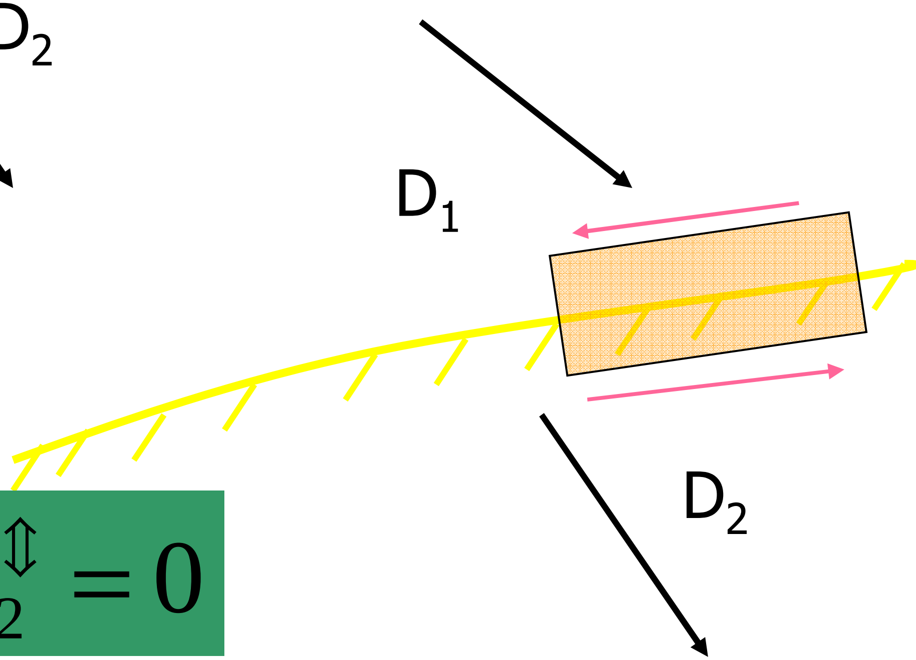
# E-field and Electric Displacement (D)

- For isotropic and linear materials
  - $\mathbf{D} = \varepsilon_0\mathbf{E}+\mathbf{P}$
  - $\mathbf{P}=\varepsilon_0\chi\mathbf{E}$
  - $\mathbf{D}=\varepsilon_r\varepsilon_0\mathbf{E}$
- Del*$\varepsilon_0$**E** = $\rho_f+\rho_b$
  - The divergence of the electric field depends on free and bound charges.
  - We associated the bound charges with the polariztion field, **P**

# Boundary Conditions: E-Field

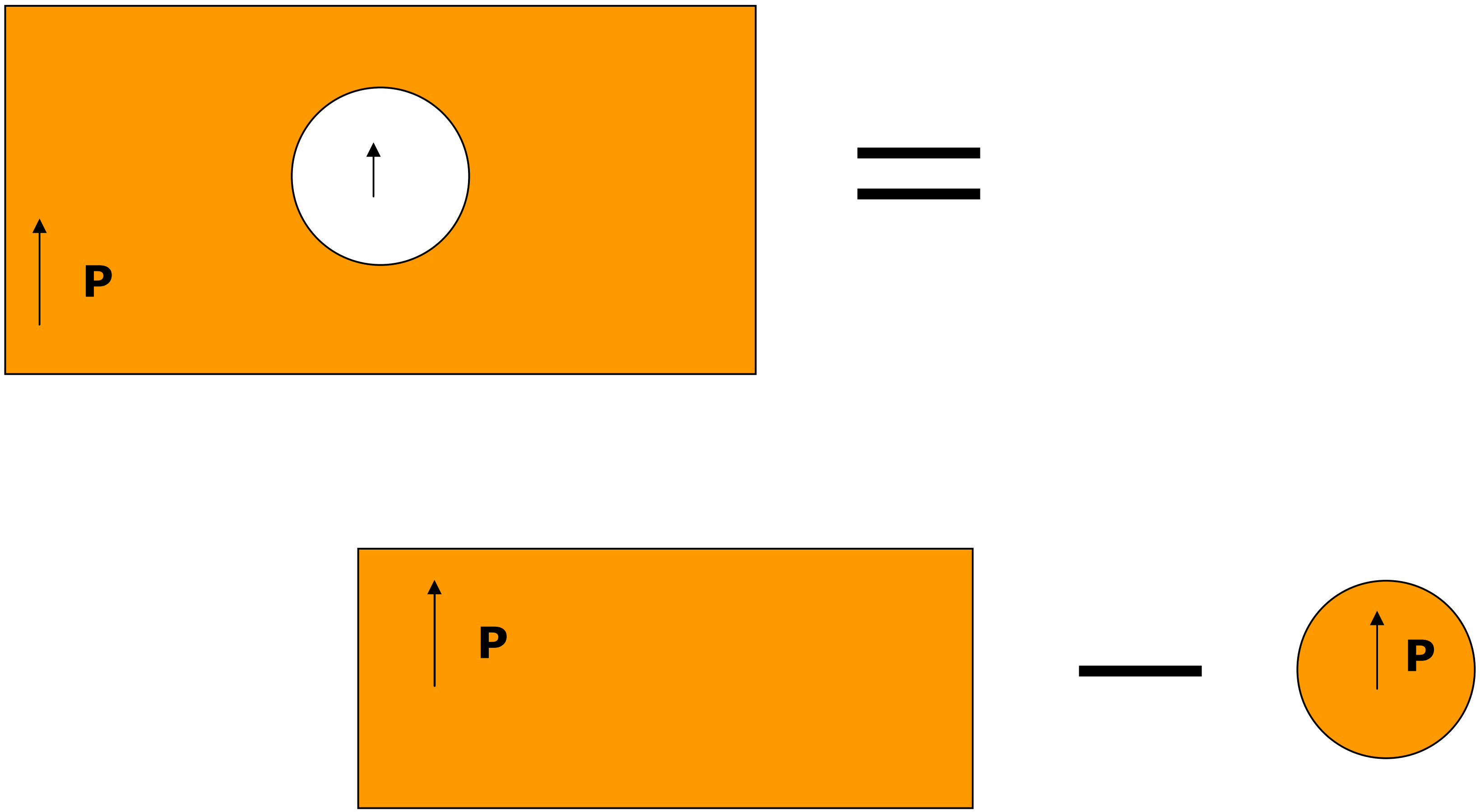
$$\varepsilon_1 E_1^{\perp} - \varepsilon_2 E_2^{\perp} = 0$$




$$\vec{E}_1^{\Updownarrow} - \vec{E}_2^{\Updownarrow} = 0$$

# Electric field in cavity of polarisable dielectric?



# Two Things to take away

- We are able to predict the properties of a liquid’s dielectric, given the gasseous state
  - This is again a demonstration of the power of our physical models, and also the extreme minuteness of atoms.
  - All of what we did depends on the near-continuous nature of atoms. They certainly are on many every-day scales.
- We are now able to use our Boundary value techniques on Dielectrics too if we are given a value for $\varepsilon_r$.