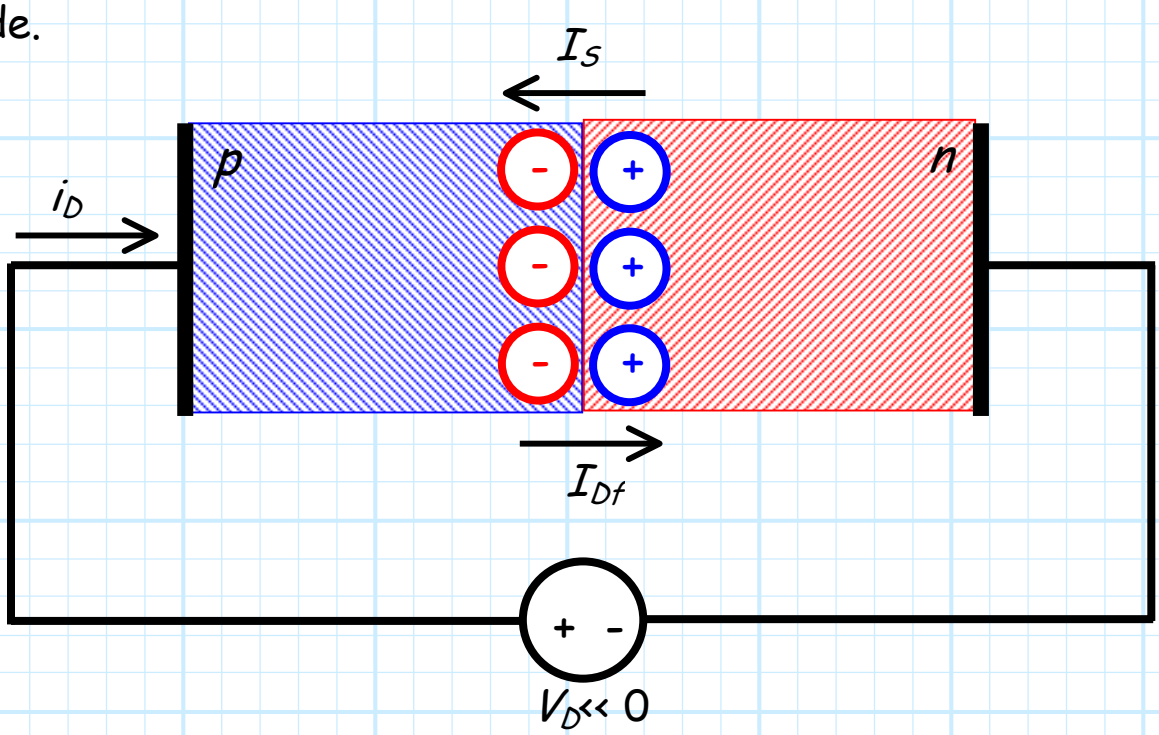
The *p-n* Junction Diode in Reverse Bias

Say we now place a significant **negative** voltage across the diode.

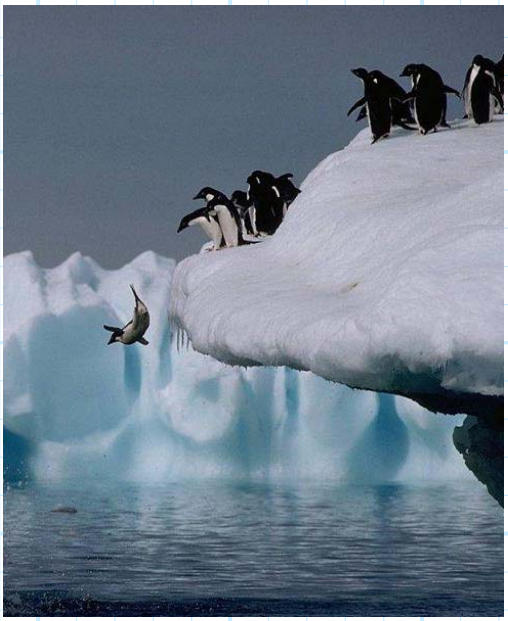


1) This negative voltage **increases** the electric field within the **depletion** region.

2) The **barrier voltage** is now so large that it **stops** virtually all **diffusion** across the junction.

3) Therefore, the diffusion current $I_{Df} = 0$:

$$I_{Df} = I_s e^{v_D/nV_T} \simeq 0 \quad \text{for} \quad v_D \ll 0$$



4) As with the forward bias case, the **drift current** remains **constant**. The holes and free electrons are swept through the depletion region with greater energy, but the **number** these charged particles remains **unchanged**.

Therefore, the **total** diode current is:

$$\begin{aligned} i_D &= I_{Df} - I_S \\ &= 0 - I_S \\ &= -I_S \end{aligned}$$

This result should **likewise** be **very** familiar !