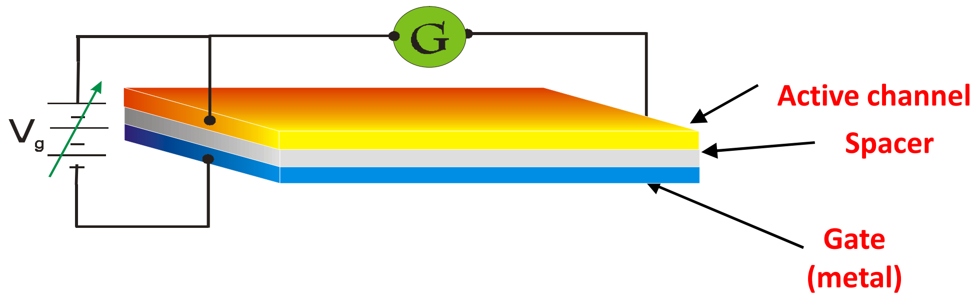
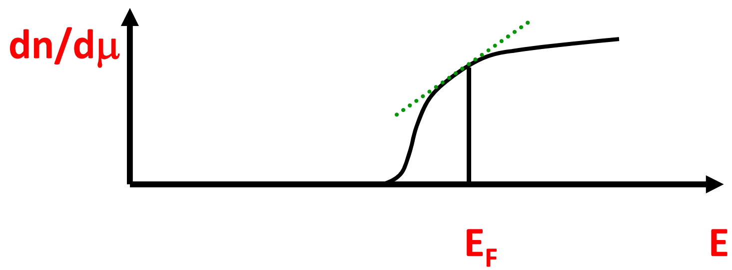
The Electron-Glass (Anderson insulator);
some open questions

Field-Effect measurements



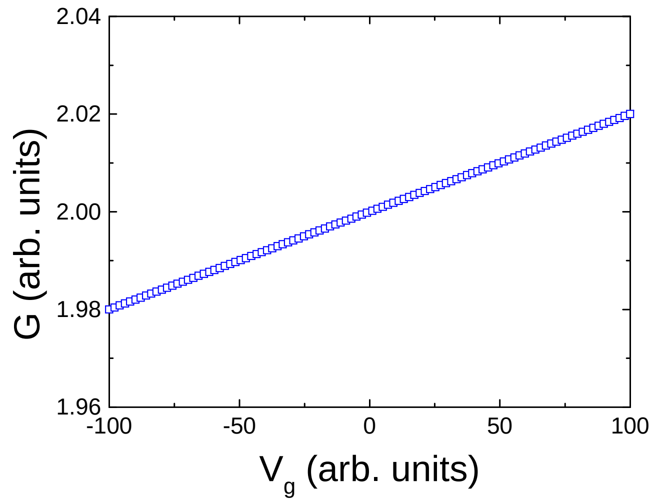


$$\sigma = e^2 \cdot \frac{\partial n}{\partial \mu} \cdot D$$

$\frac{\partial n}{\partial \mu} \equiv$ **Thermodynamic DOS**

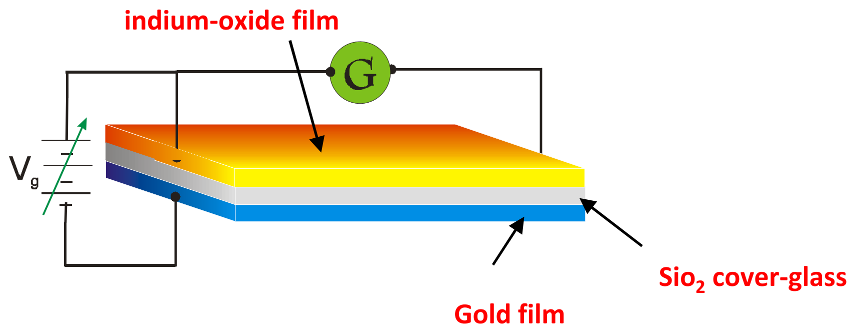
$D \equiv$ **diffusivity**

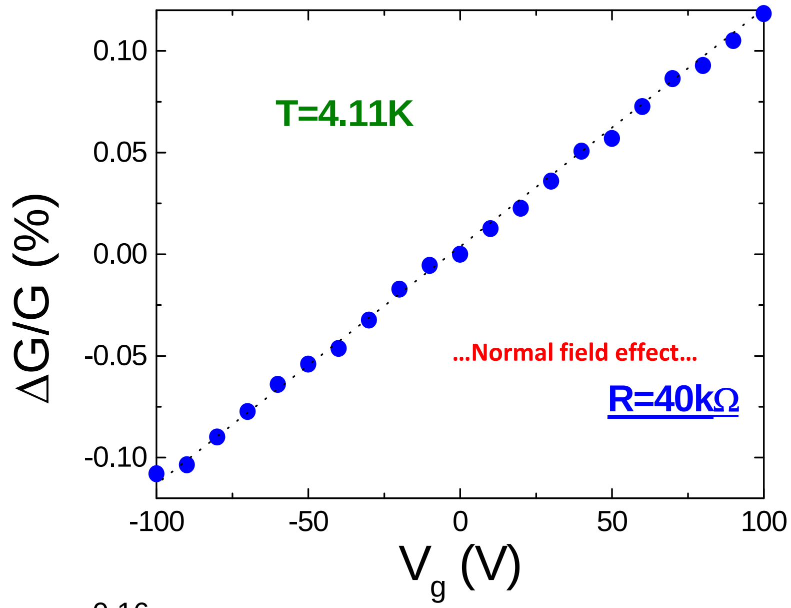
for small ΔV_g ($\Delta E_F / E_F << 1$)

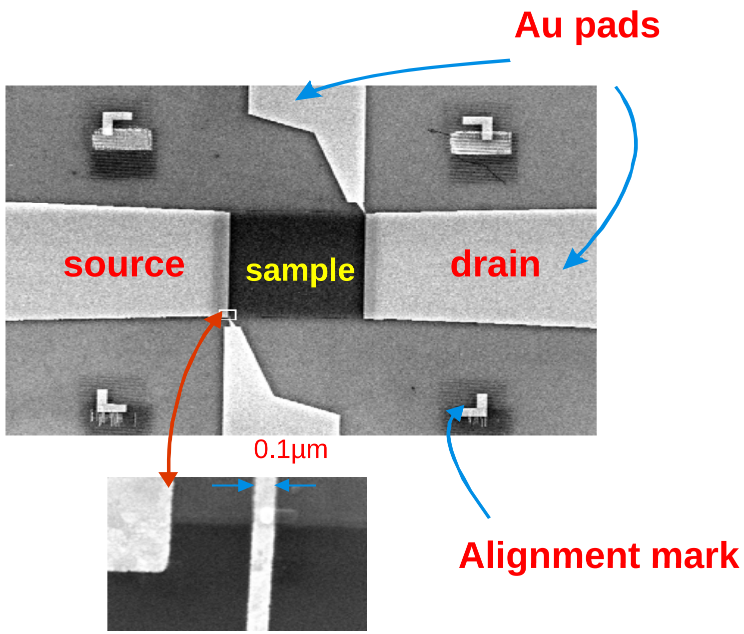


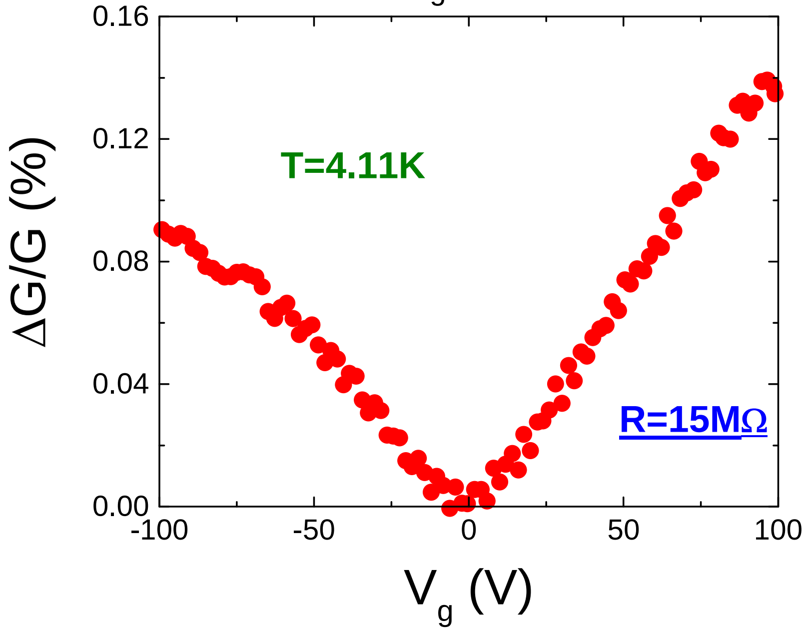
…origin of the "normal" field effect…

... crossing the M-I border ...



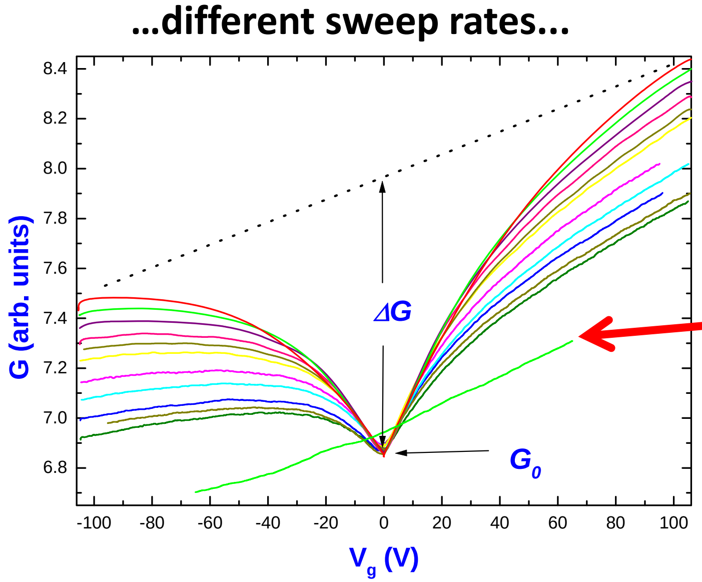




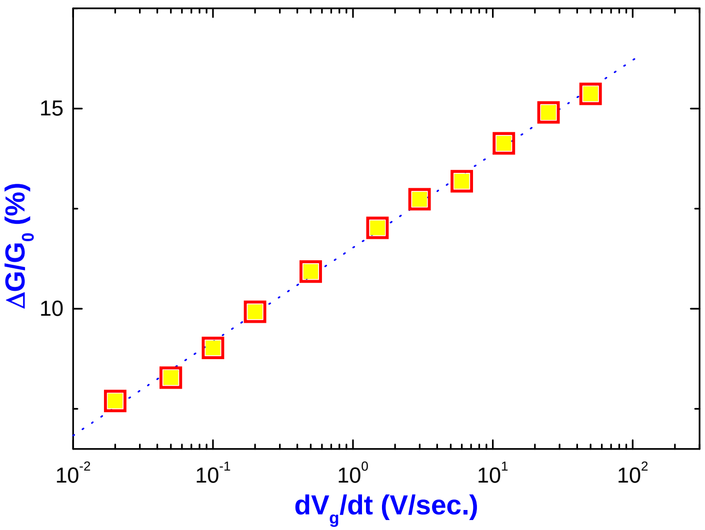


Note added in proof. Professor M. Pollak has brought to our attention that the glassy behavior associated with the SC may be related to a long-lived excited state of the electron system. The ground state in this picture is alleged to have minimum conductivity. This conjecture is now under investigation.

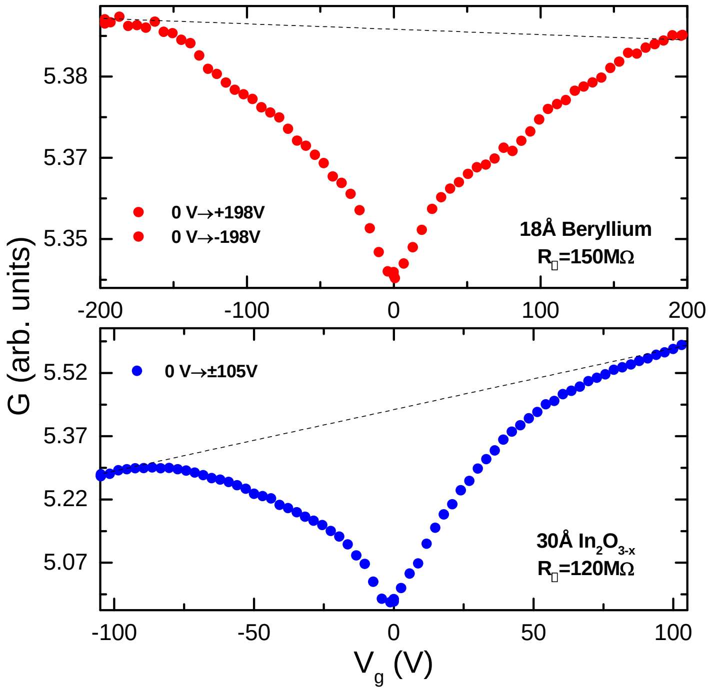
…it's non-equilibrium !!…

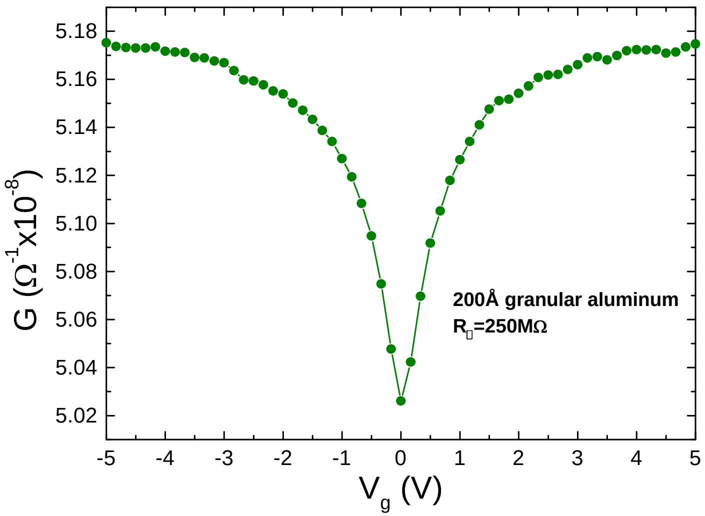


The "normal" (equilibrium), field-effect

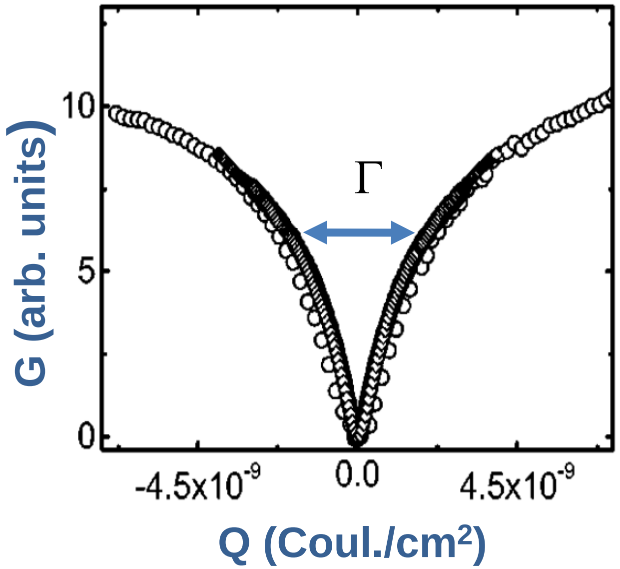


…"normal" field effect variations…



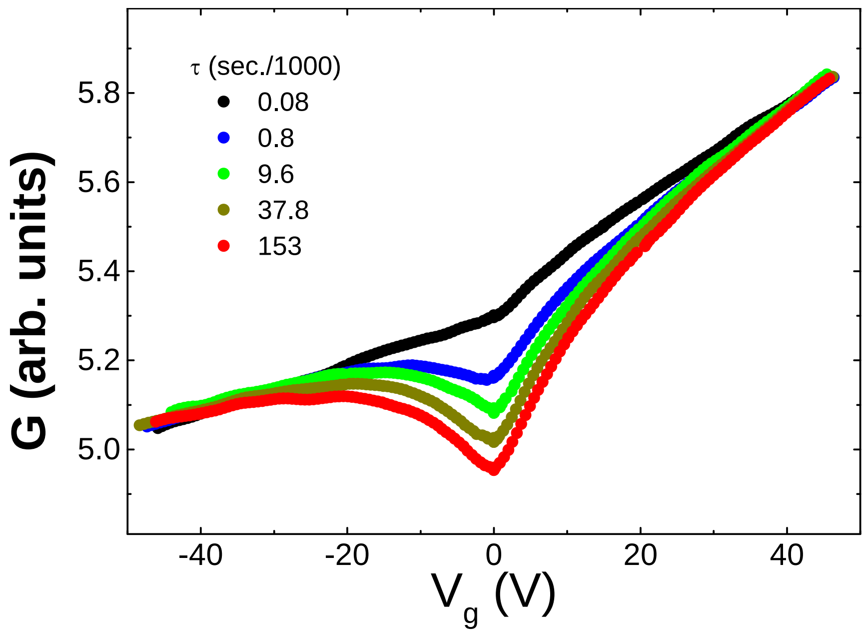


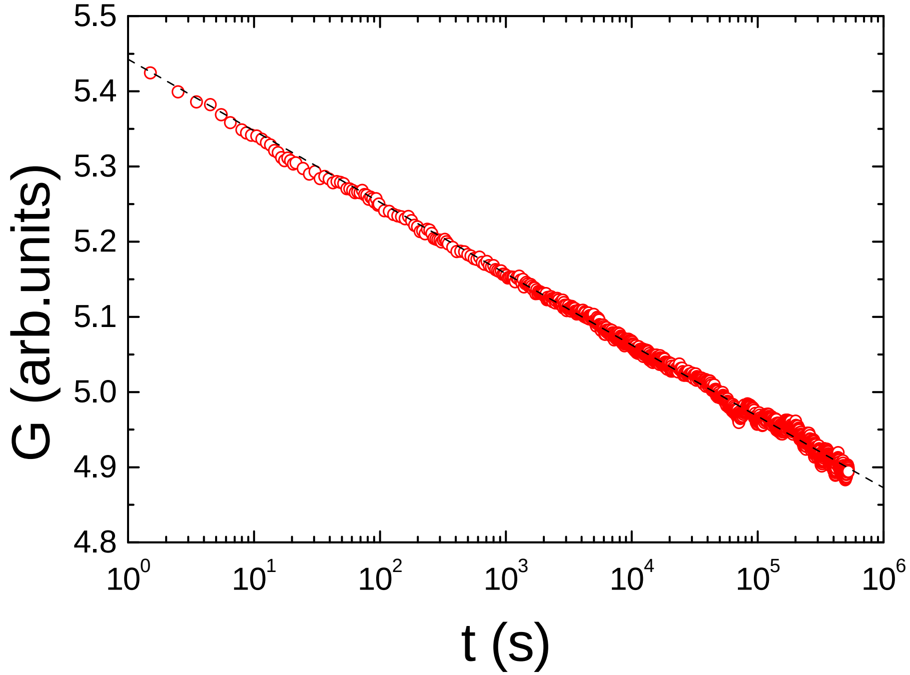
same film, different spacer…



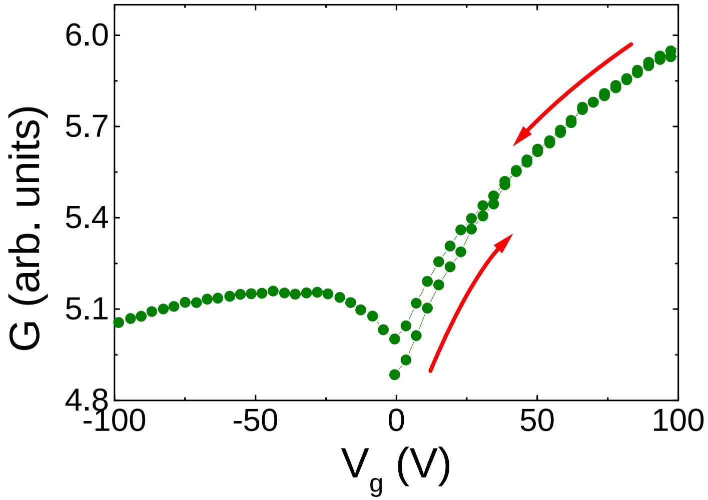
$$\Delta\varepsilon \propto \frac{\Delta Q}{\partial n / \partial \mu}$$

...slowing relaxation...

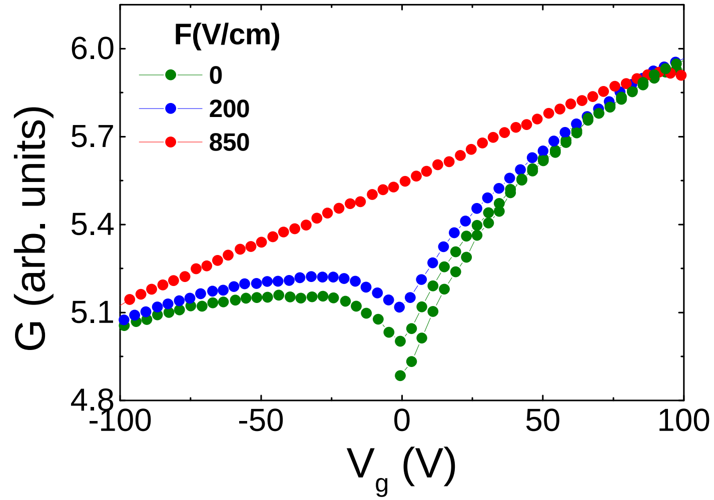




...the memory

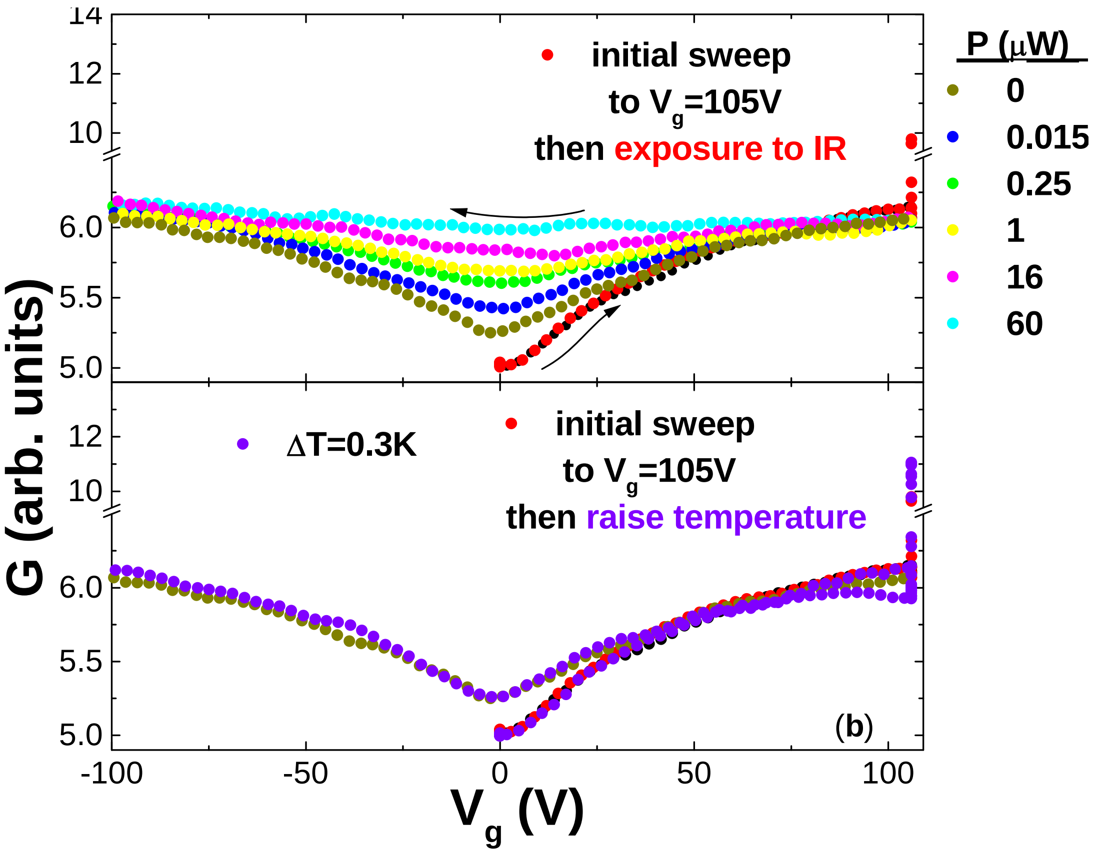


...and erasing it...



…a more expensive way to erase memory…

…Zap it with infra-red…



Men in Black

Neuralyzer

Limited Edition

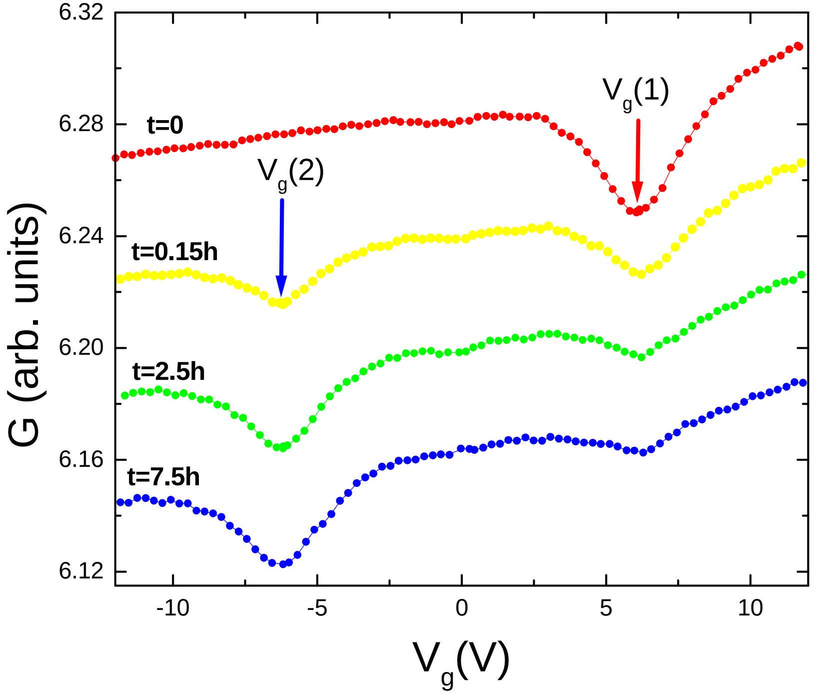
$199.00

SOLD OUT

the basic properties of the memory-dip

…it's a non-equilibrium feature…

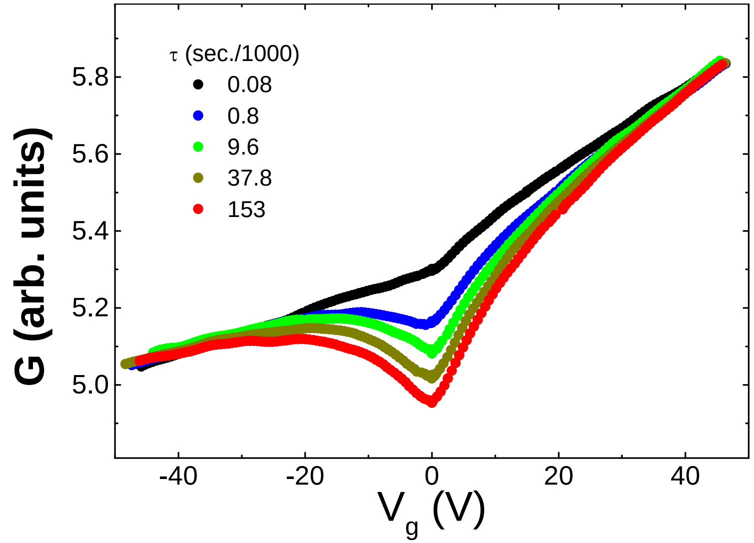
…it's centered around the equilibration V_g…



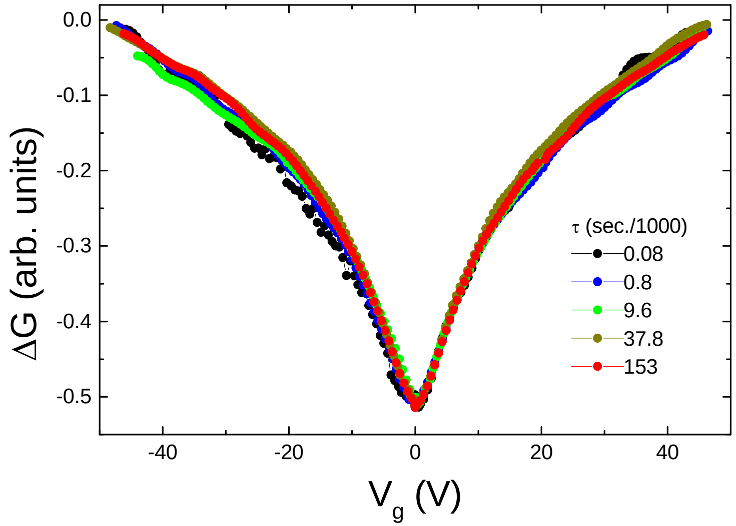
…and more…

1) changing time…

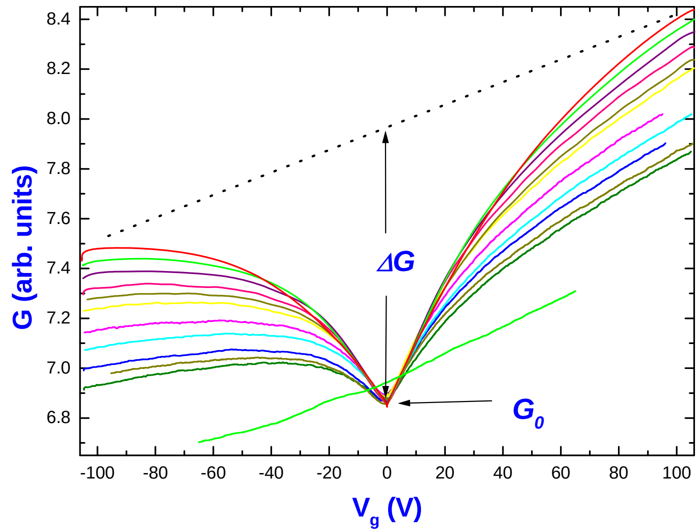
…magnitude of cusp increases with time following cool-down…



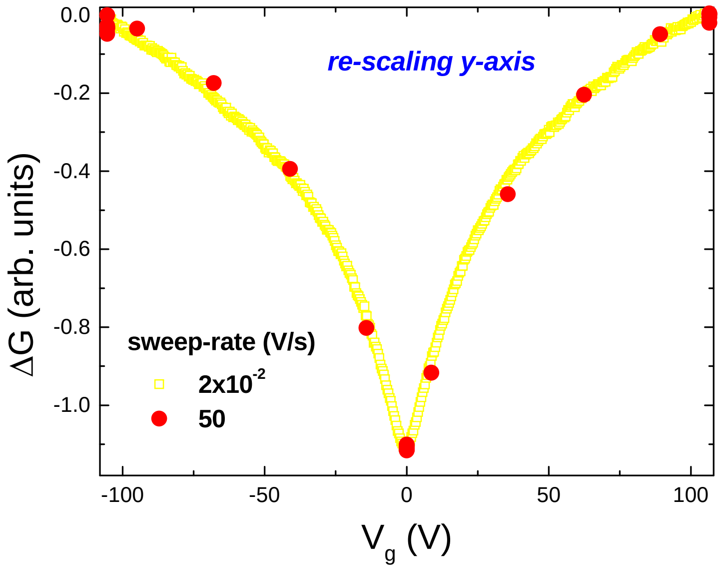
…but removing the "normal" field effect and rescaling the y-axis demonstrates that the SHAPE is invariant…



2) changing the sweep rate...



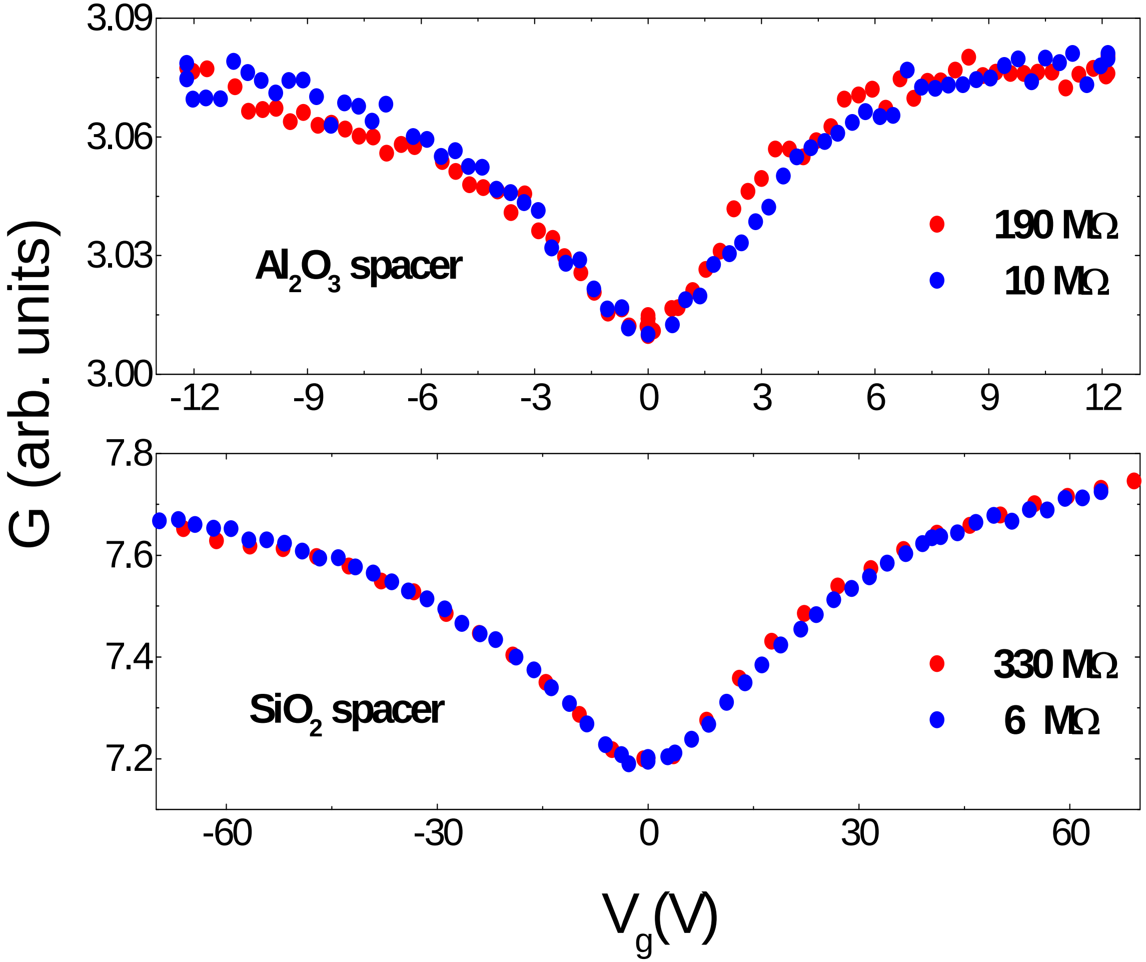
...changes the MAGNITUDE of the memory-dip but not it's SHAPE...



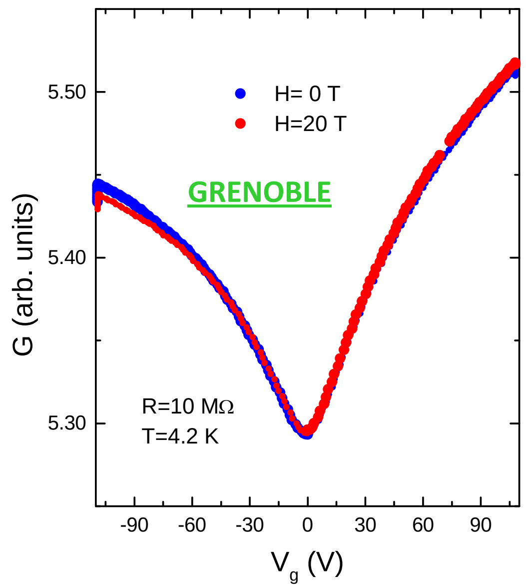
...7.5 seconds sweep compared with a 5 hours sweep

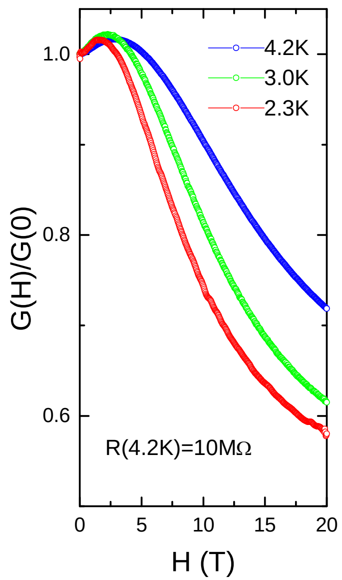
3) changing disorder...

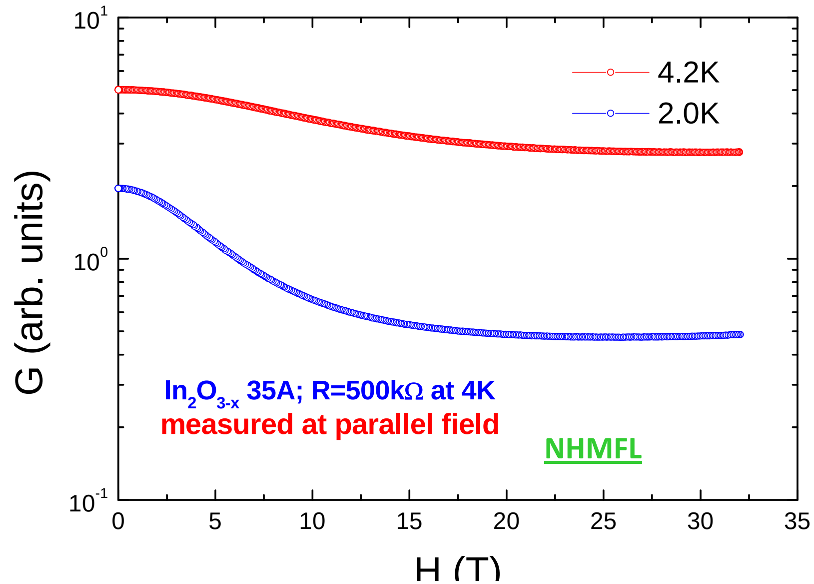
...changes the MAGNITUDE of the memory-dip
but not it's SHAPE...

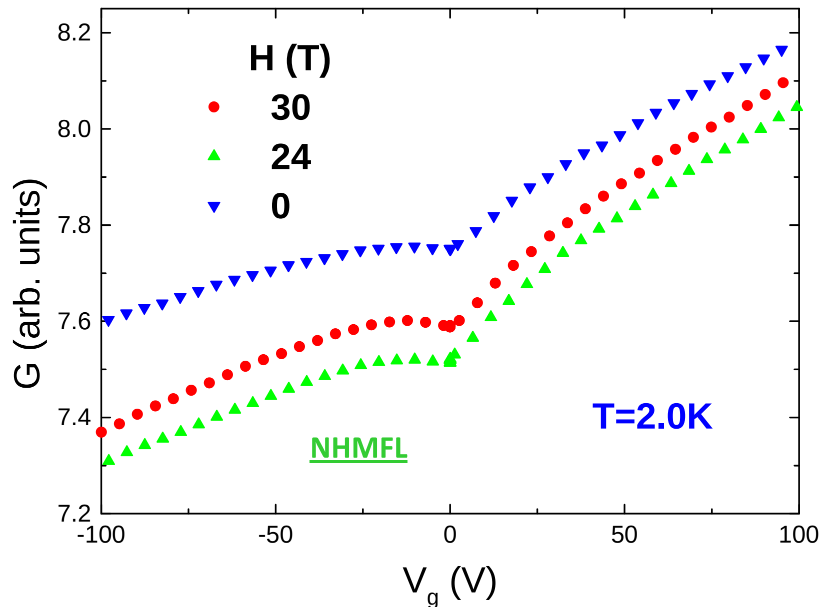


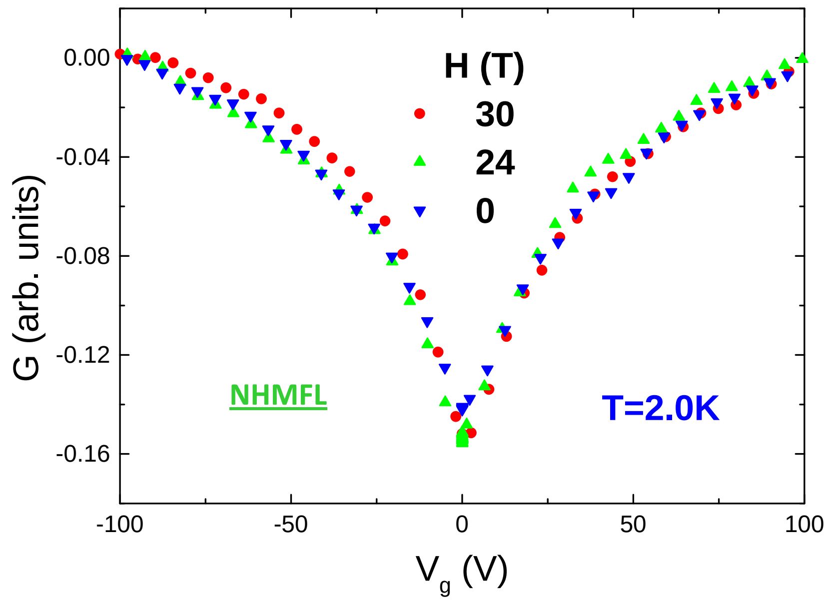
4) changing magnetic field...





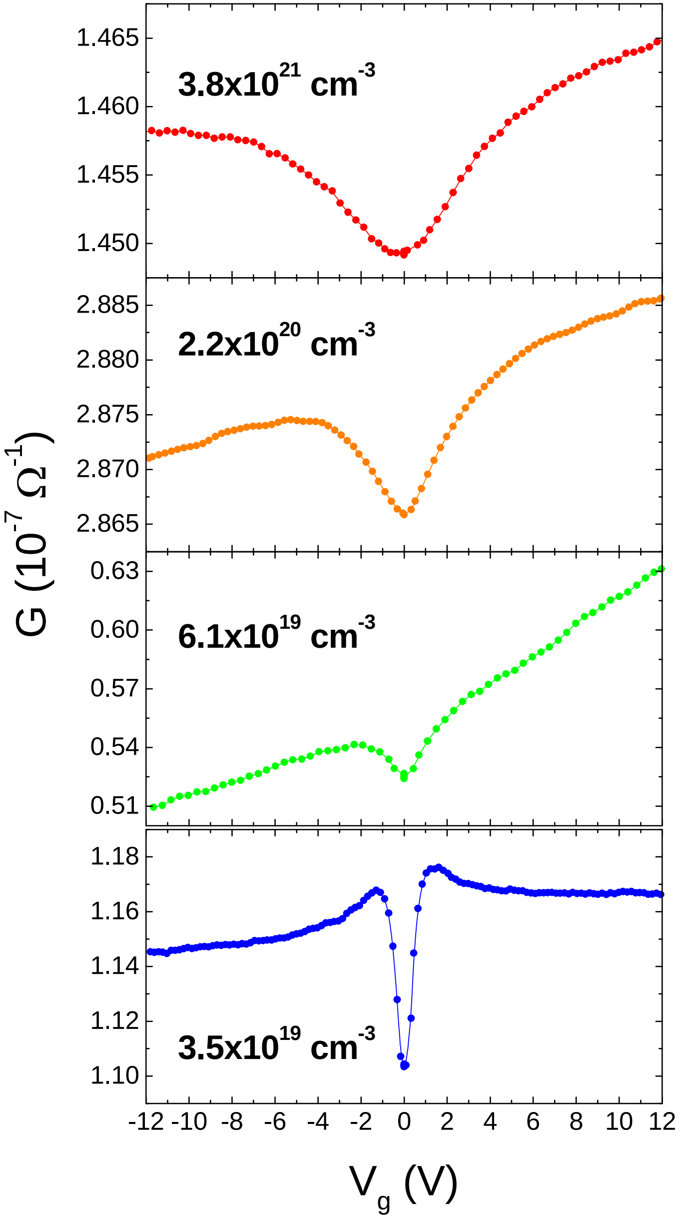




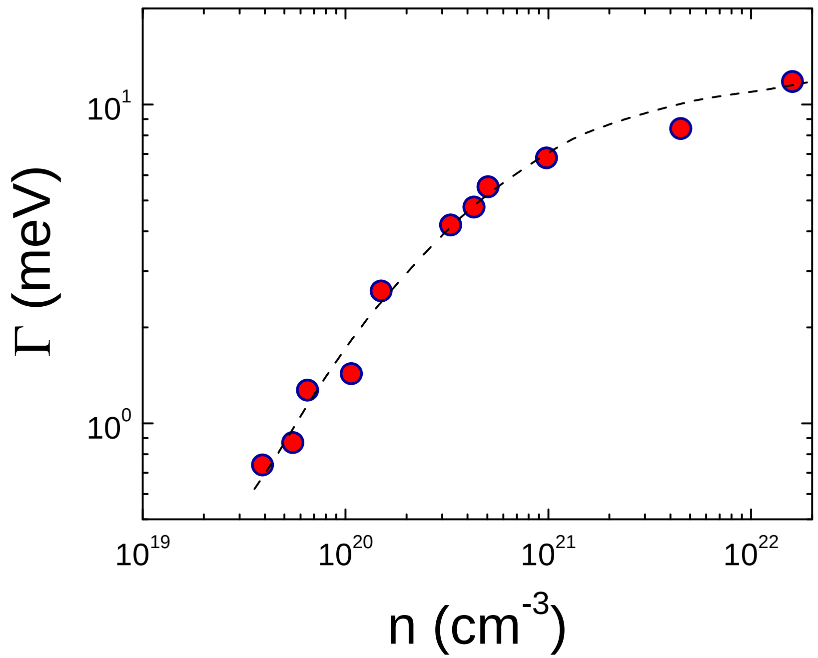


...what DOES affect the cusp-width :

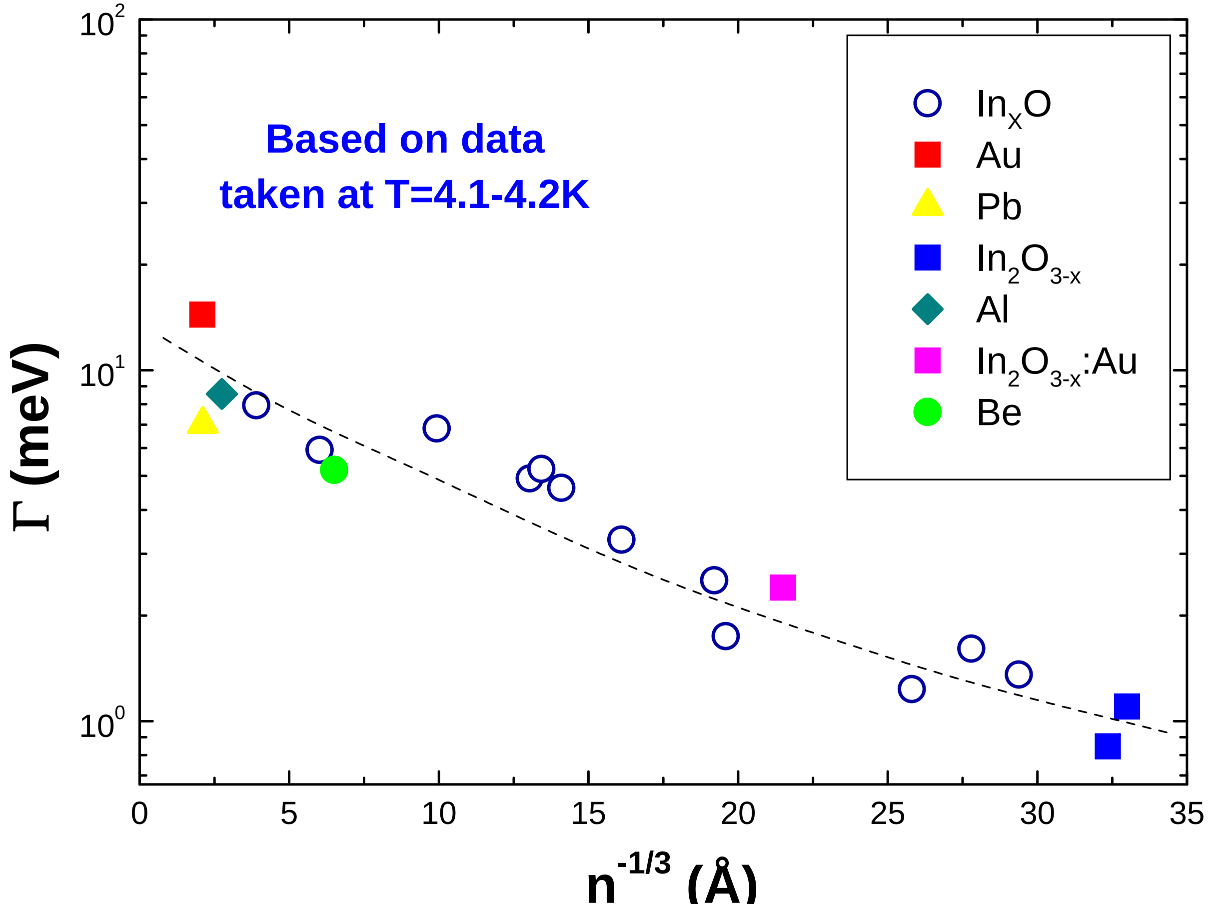
- The carrier concentration - n



...amorphous In_xO with different composition (hence different n)



… the bigger picture – other systems follow suit…



In_2O_{3-x}

In_xO

Aluminum

Lead

Bismuth

Gold

Nickel

Beryllium

$$\ln\frac{G(T)}{G_0} \propto -T^{-\alpha}$$

$$0.3 \le \alpha \le 1$$

Q: what's special about large n ??

Q: what is this memory-dip ??