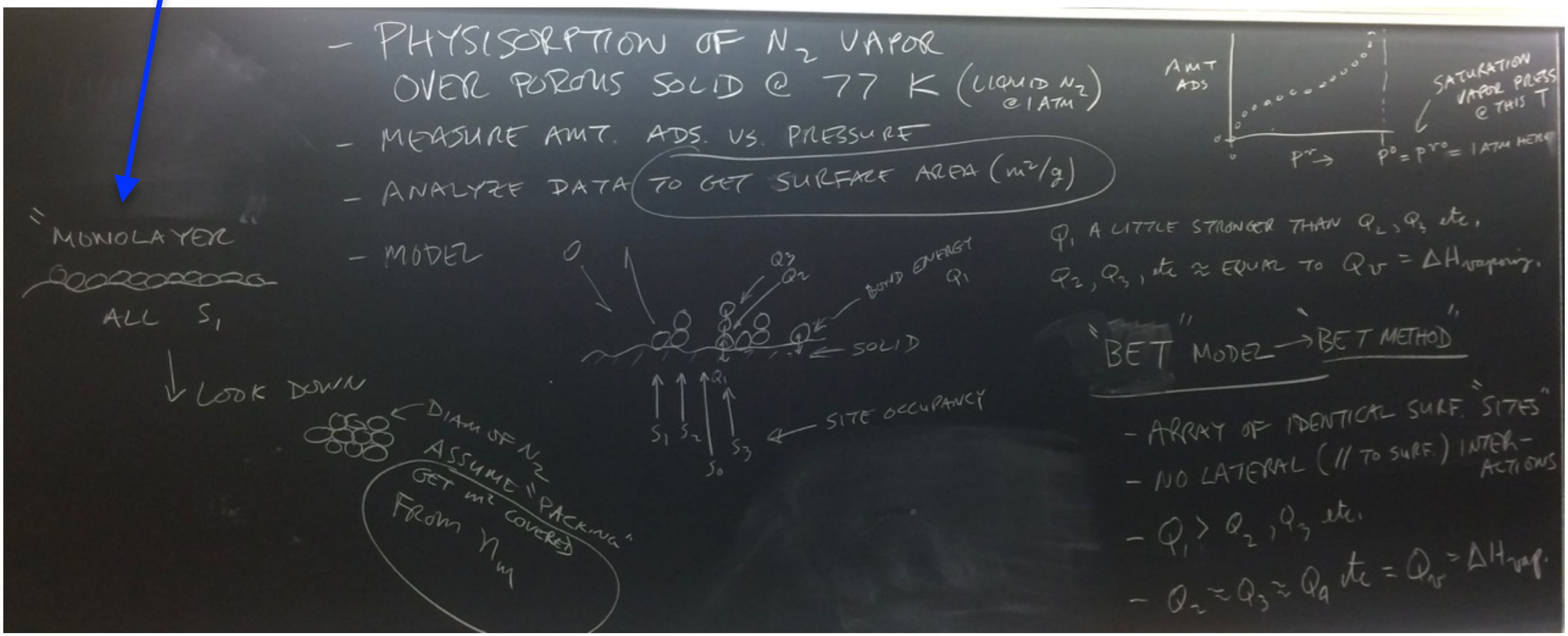
A monolayer is never present in this experiment but we want to determine n(m) mol/g



@ EQUILIBRIUM $r_{ADS} = r_{DES}$

& DISTRIBUTION OF SITE OCCUPANCY IS CONST.

e.g., # S_0 = CONSTANT, # S_1 = CONSTANT, etc.

for S_1: $a_1 P S_0 = b_1 e^{-Q_1/RT} S_1$

ADS. RATE CONSTANT $\quad r_{ADS} = r_{DES} \quad$ DESORPTION RATE CONST.

for S_2, S_3, S_i: $a_i P S_{i-1} = b_i e^{-Q_v/RT} S_i$

$$\frac{S_i}{S_{i-1}} = P\left(\frac{a_i}{b_i}\right) e^{Q_v/RT}$$

VAPOR OVER SURFACE OF ITS OWN LIQUID

$$a_i P^o = b_i e^{-Q_v/RT}$$

$$\frac{1}{P^o} = \left(\frac{a_i}{b_i}\right) e^{Q_v/RT} \xRightarrow{\times P} \frac{P}{P^o} = P\left(\frac{a_i}{b_i}\right) e^{Q_v/RT}$$

DEFINE $X \equiv \dfrac{P}{P^o} = P\left(\dfrac{a_i}{b_i}\right) e^{Q_v/RT} = \dfrac{S_i}{S_{i-1}}$ for $i \geq 2$

$$y \equiv P\left(\frac{a_1}{b_1}\right) e^{Q_1/RT} = \frac{S_1}{S_0}$$

$C = \dfrac{y}{X} \approx e^{(Q_1 - Q_v)/RT}$, SINCE ASSUME $\left(\dfrac{a_i}{b_i}\right) \approx \left(\dfrac{a_1}{b_1}\right)$

- FROM SUMMATION OF $S_0 + S_1 + S_2 \cdots$ WE GET # MOLES ADSORBED @ $P = n$
- FROM TOTAL # SURFACE SITES GET n_m = # MOLES ADS IN HYPOTHETICAL "MONOLAYER"
- SOME ALGEBRA ....

$$\frac{X}{n(1-X)} = \frac{1}{C n_m} + \left(\frac{C-1}{C n_m}\right) X$$

$\Rightarrow$ DO EXPERIMENTS MEAS n vs. P

$$X = \frac{P}{P^o}$$

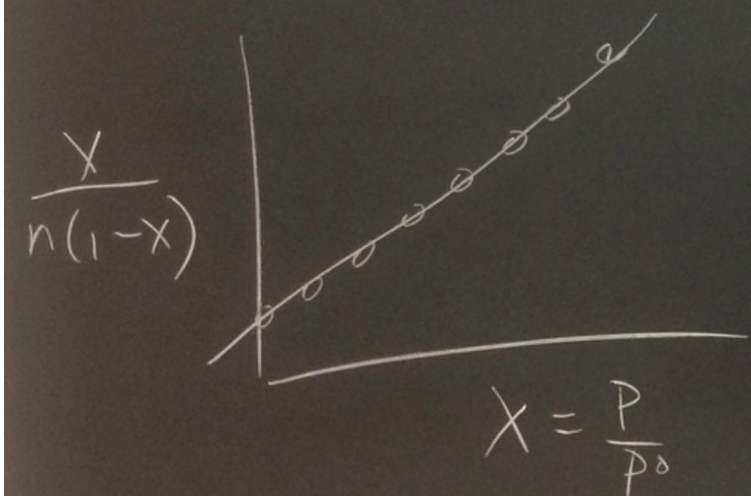
∴ HAVE TABLE OF X & n VALUES

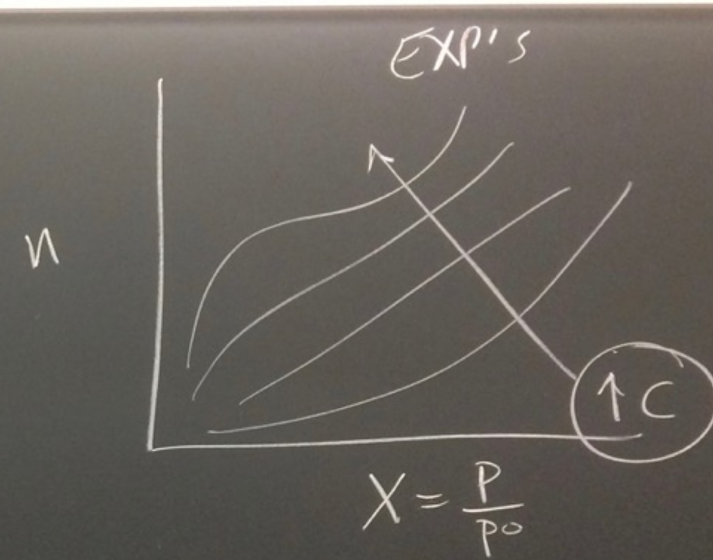
PLOT $\frac{X}{n(1-X)}$ vs. X

INTERCEPT = $\frac{1}{C n_m}$

SLOPE = $\left(\frac{C-1}{C n_m}\right)$

ALGEBRA → GET C & n_m VALUES

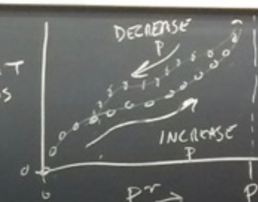




- NOW SLOWLY DECREASE P & MEASURE HOW MUCH IS ADSORBED @ EACH P

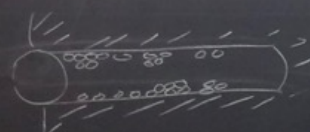
- HYSTERESIS → WHY? → HAVE MORE ADS @ SAME P

- CONSIDER POROUS SOLID MODELED AS HAVING CYLINDRAL PORES OF DIFF. SIZES



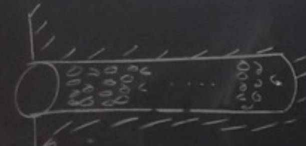
$P^o = P^{ro} = 1$ ATM HERE
N_2 @ 77 K

SATURATION VAPOR PRESS @ THIS T



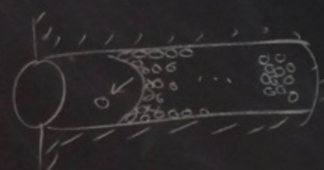
← PICTURE AS WE ↑ P & MEAS AMT ADS

WHY? USE TO ESTIMATE DIFFUSION COEFF IN POROUS MAT'L

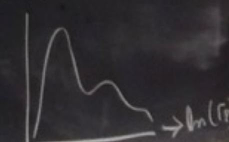


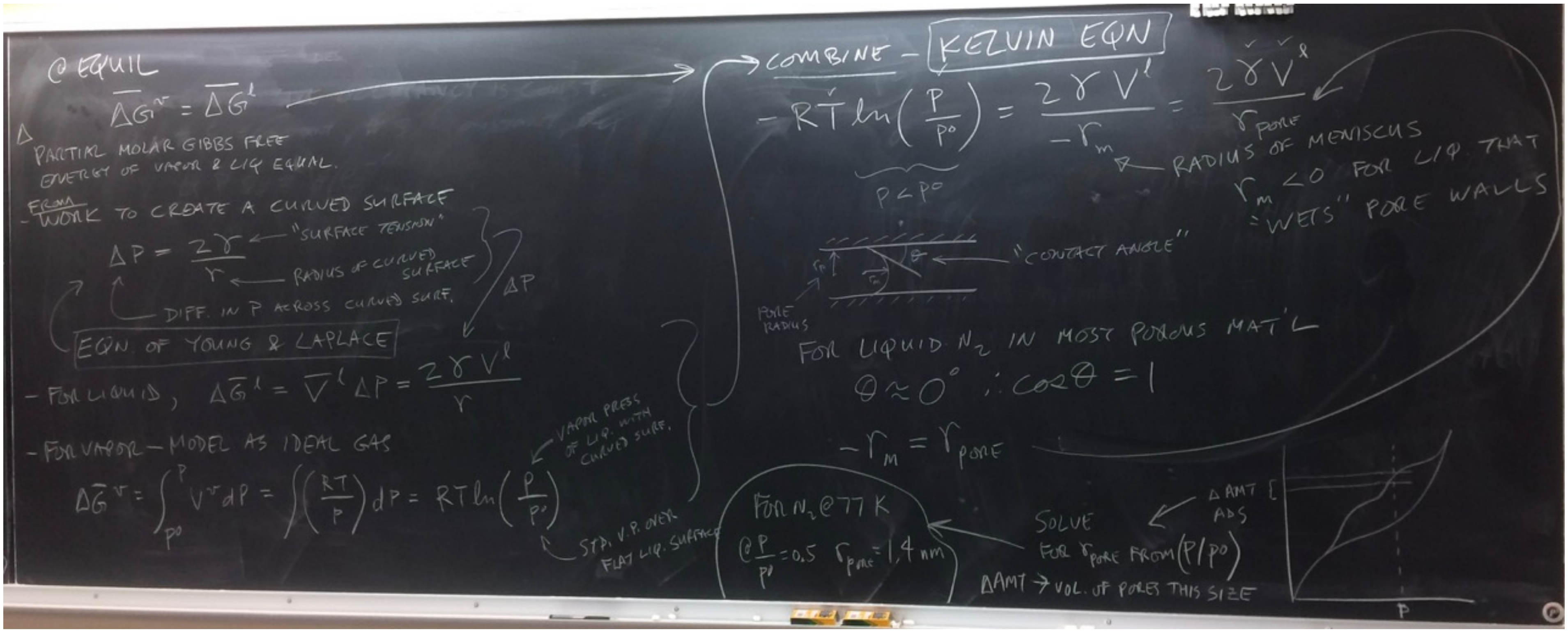
← PICTURE NEAR $x' = \frac{P}{P^{ro}} = 1$

PORE FILLED WITH LIQUID N_2 → IF CAN MEASURE, THEN GET # MOLE & (LIQUID) PORE VOLUME IN MAT'L FOR PORES THIS SIZE → ANALYZE DATA TO GET PORE VOLUME VS. PORE RADIUS DISTRIBUTION



← AS P IS ↓ WE GET PORE EMPTYING AS N_2 VAPOR DESORBS FROM CURVED LIQUID SURF. OR "MENISCUS"





ALSO READ notes at ReactorLab.net, Resources, Grad CRE Notes, Adsorption and Pore size distribution