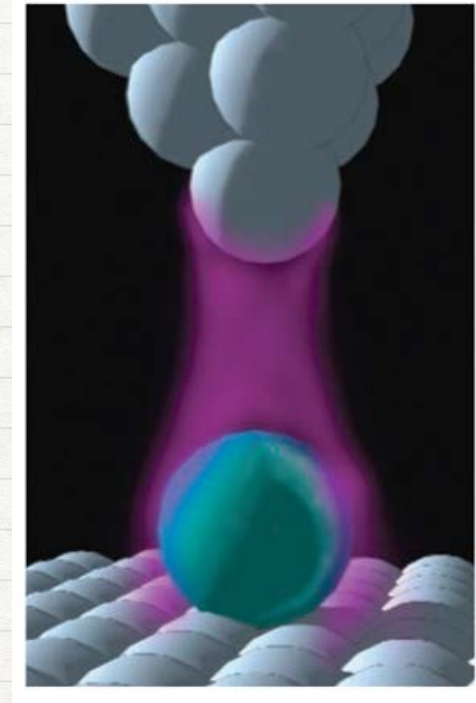
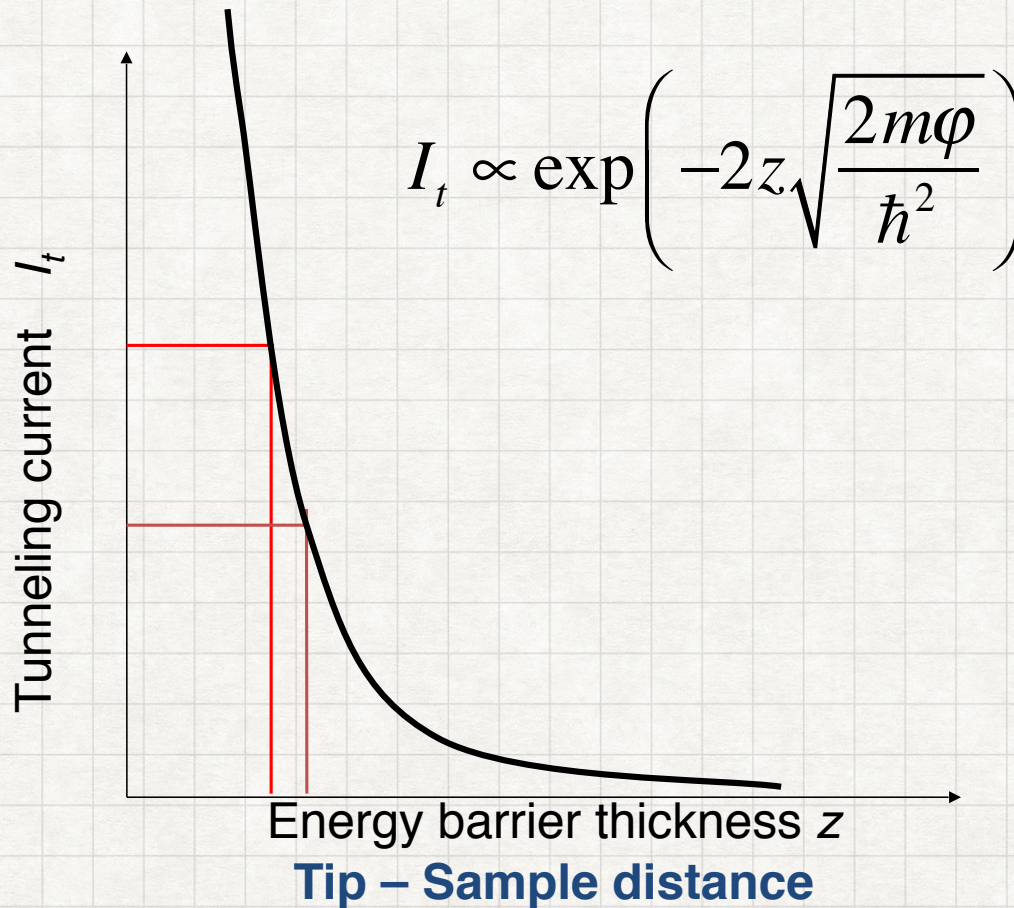


何故原子が見えるか

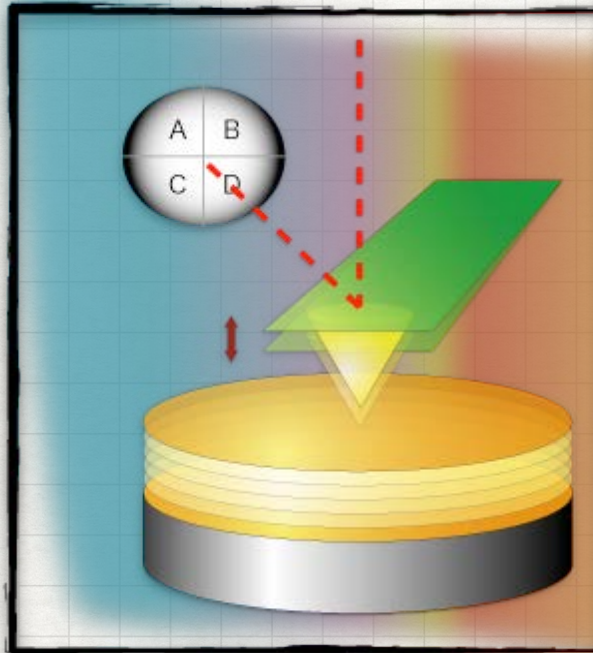
Tunneling probability of electrons



Bode *et al.* Science 306 (2004) 424.

探針-試料間距離が **nm** 変化するとトンネル電流が1桁変化する

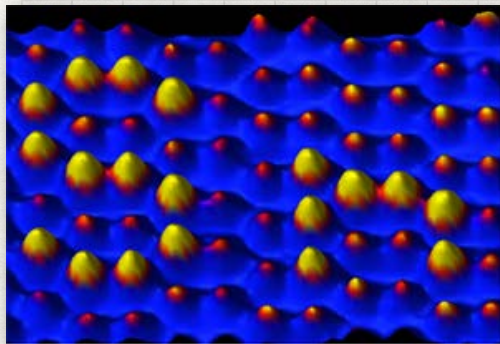
原子間力顕微鏡の動作原理



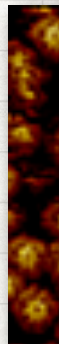
AFMで使われるカンチレバー

- ・ ・ ・ バネ定数は1 N/m
 - ・ ・ ・ 1 m伸ばすと1 Nの復元力
 - ・ ・ ・ 1 Nは約0.1 kg重に相当 ($f = mg$)
 - ・ ・ ・ 1 mで100 g重なので、
1 cmで1 g重
 - ・ ・ ・ その程度の秤は台所にも転がっている
- 何がポイントなのか???

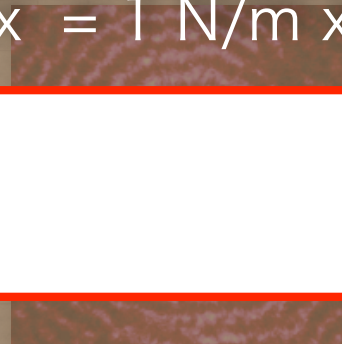
$$F = kx = 1 \text{ N/m} \times 1 \text{ nm} = 1 \text{ nN}$$



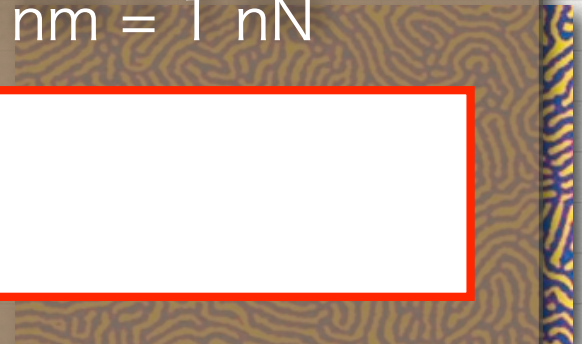
Sn embedded in Ge lattice
NC-AFM by S. Morita@U. Osaka



Protein GroES



HDPE

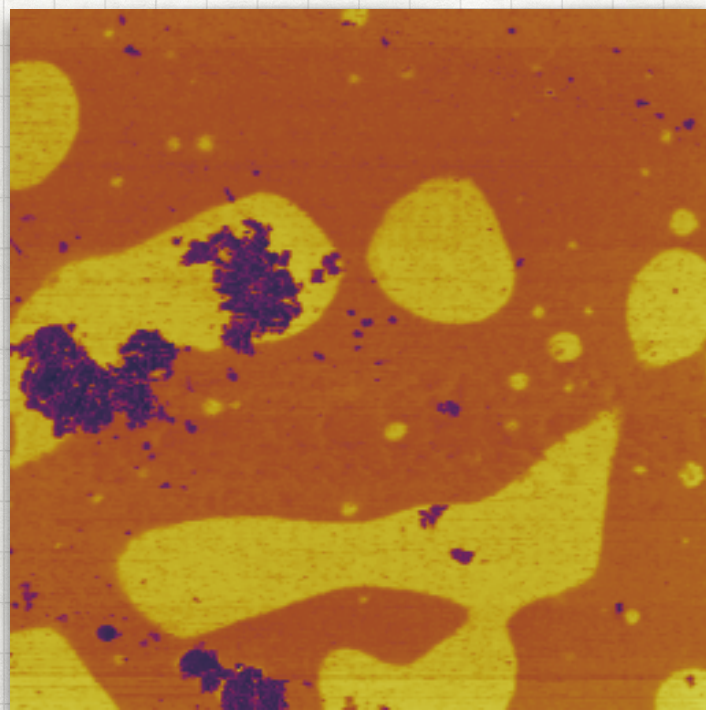


SBS copolymer TM phase

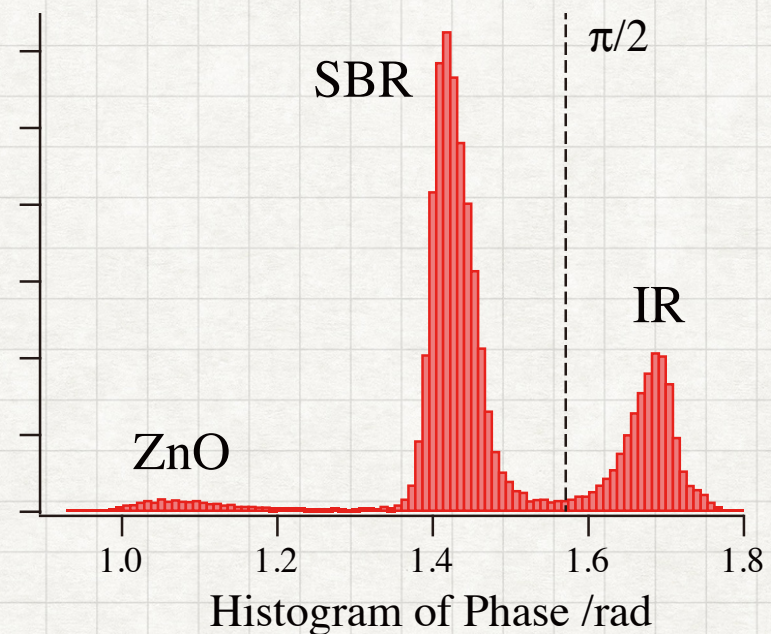
タッピング位相像 (ゴムブレンド)

SBR/IR 7:3

(styrene-butadiene rubber) (isoprene rubber)



Phase /rad

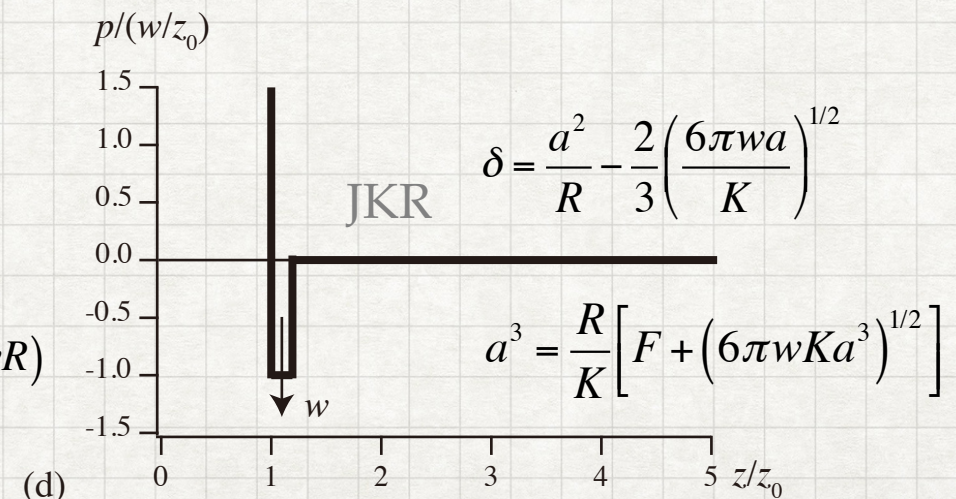
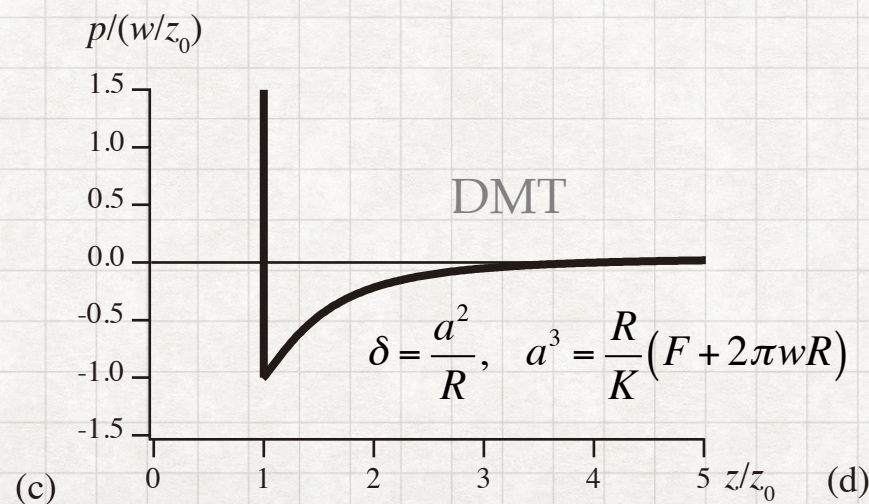
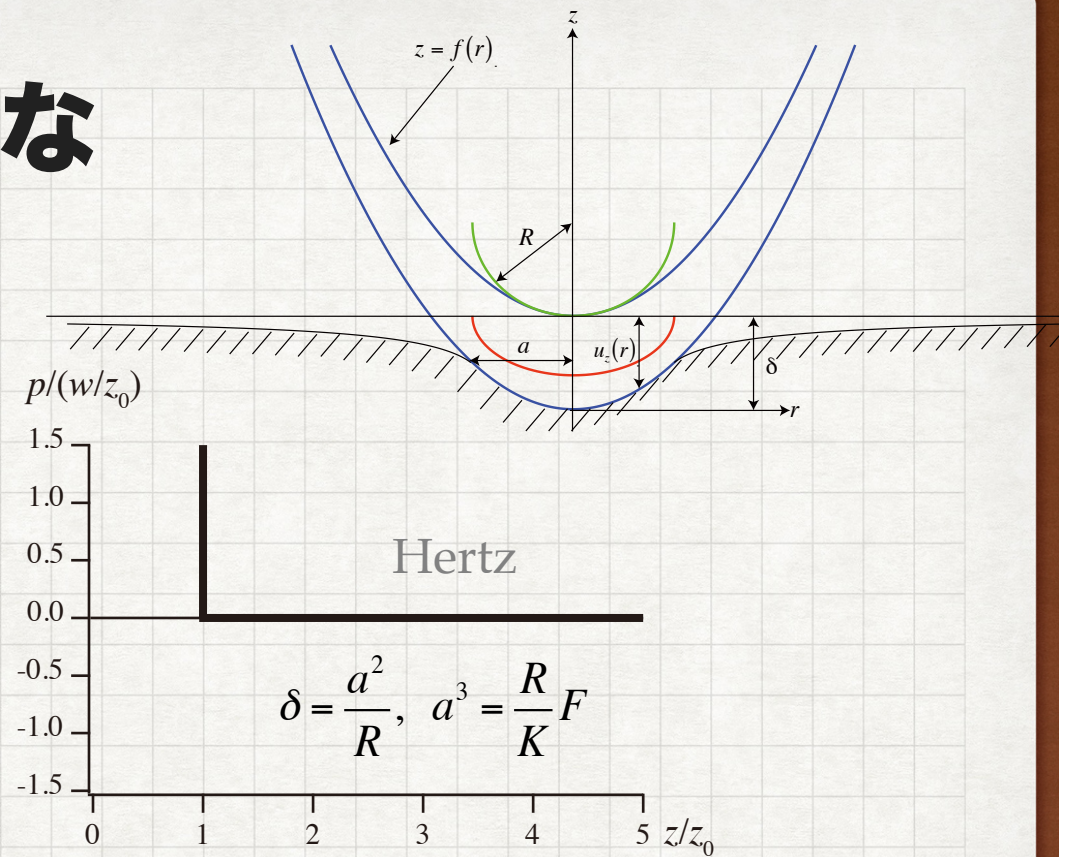
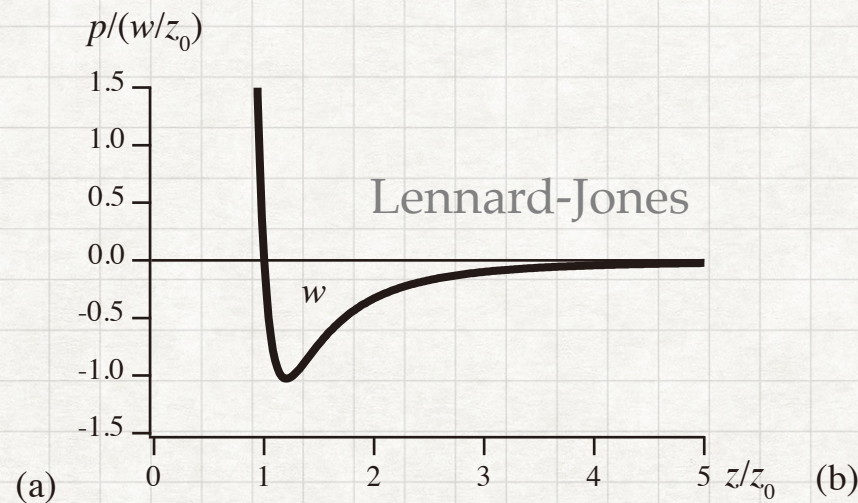


Phase Image ($3.3 \mu\text{m}$)

$f_0 = 77.9 \text{ kHz}$, $A/A_0 = 0.81$

K. Nakajima, *et al.*, *Microscopy*, **63**, 193 (2014).

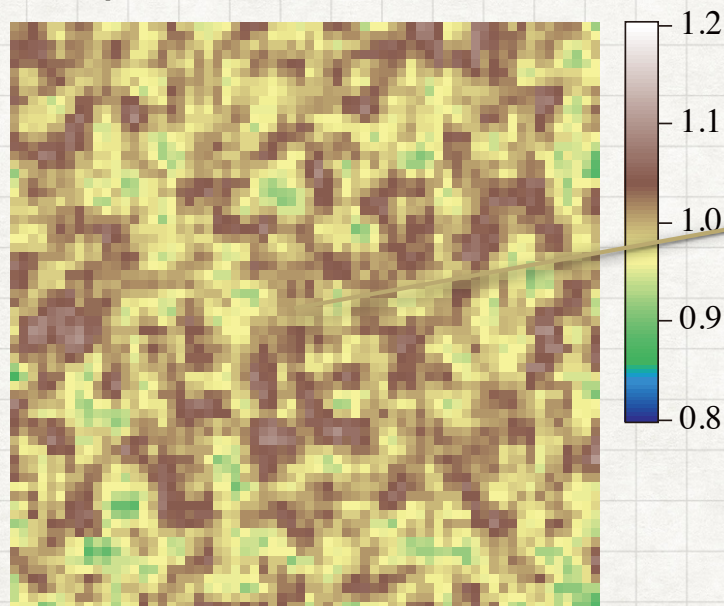
AFM弾性計測に必要な 接触理論概観



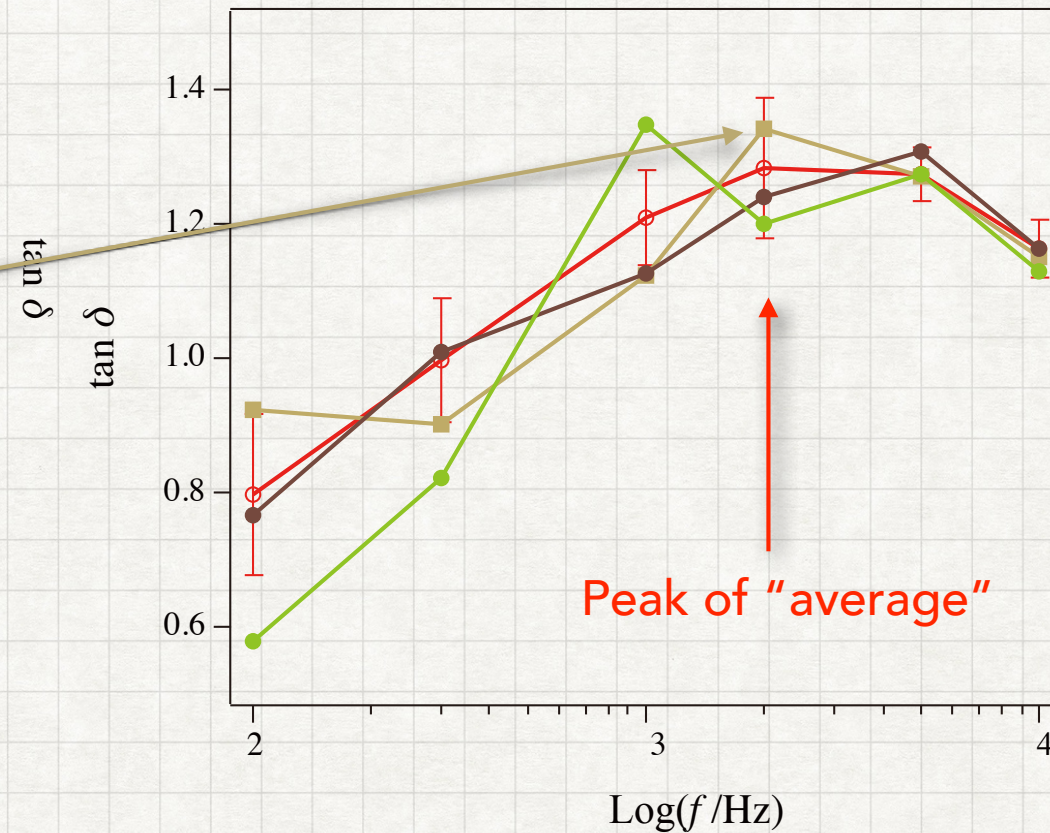
温度時間換算則の破れ？ Pure SBR Vulcanizates

($T_g = -26^\circ\text{C}$)

1.0 μm , 14.0 $^\circ\text{C}$, 300 Hz



$a_T f = 1.3 \text{ kHz}$



Peak of "average"

