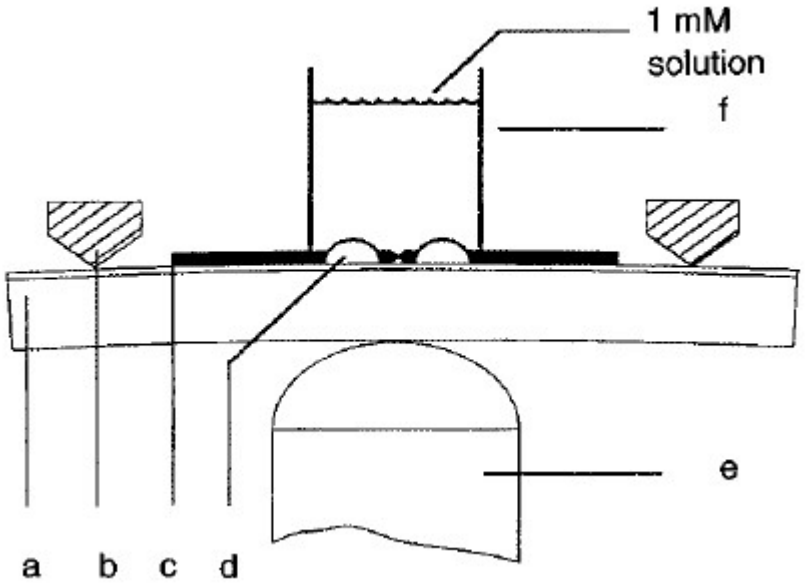
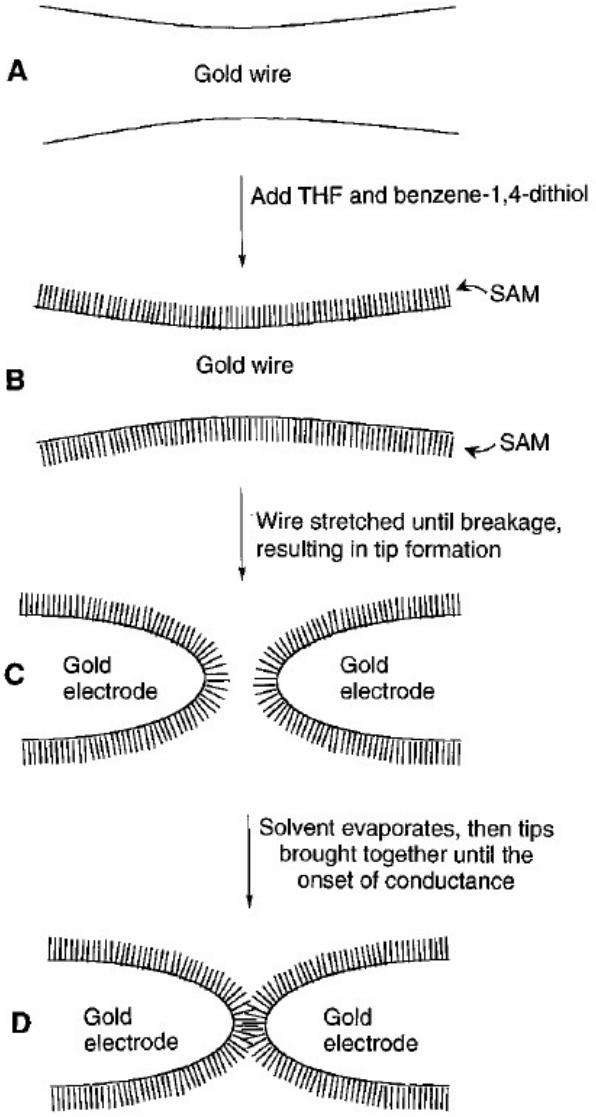
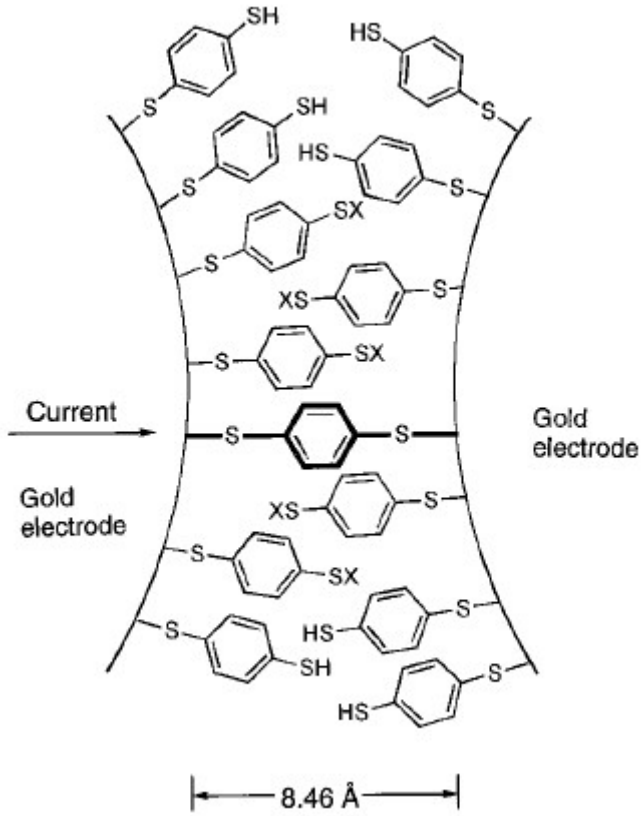
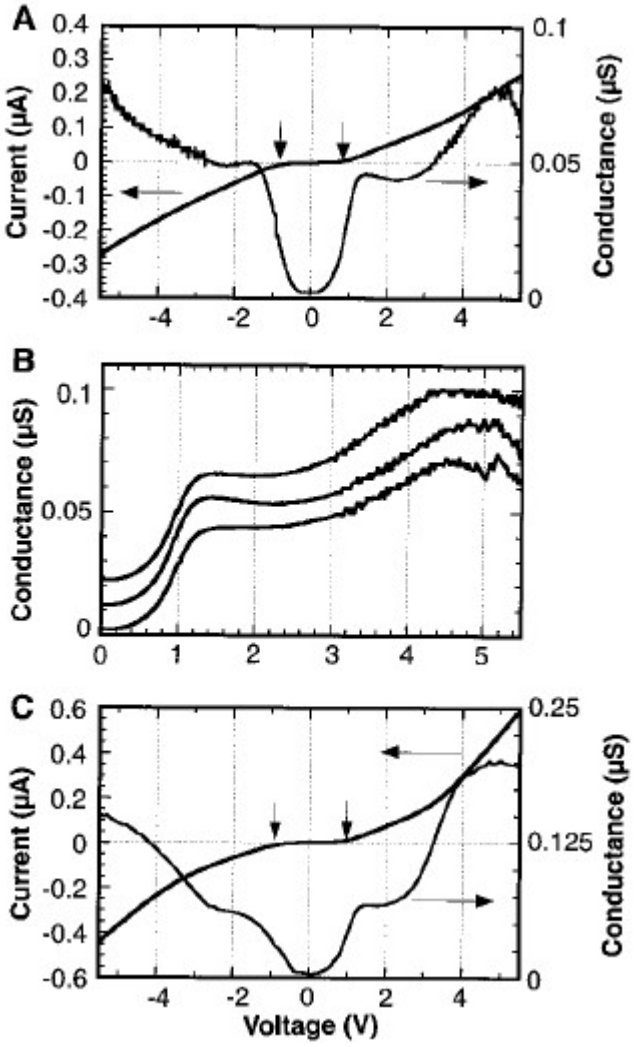
Single molecule conductance






SH
HS
SH
HS
SX
XS
SX
Current
Gold
electrode
Gold
electrode
XS
SX
HS
SH
HS
8.46 Å


A
Current (μA)
Conductance (μS)
B
Conductance (μS)
C
Current (μA)
Conductance (μS)
Voltage (V)

Measurement of Single-Molecule Resistance by Repeated Formation of Molecular Junctions

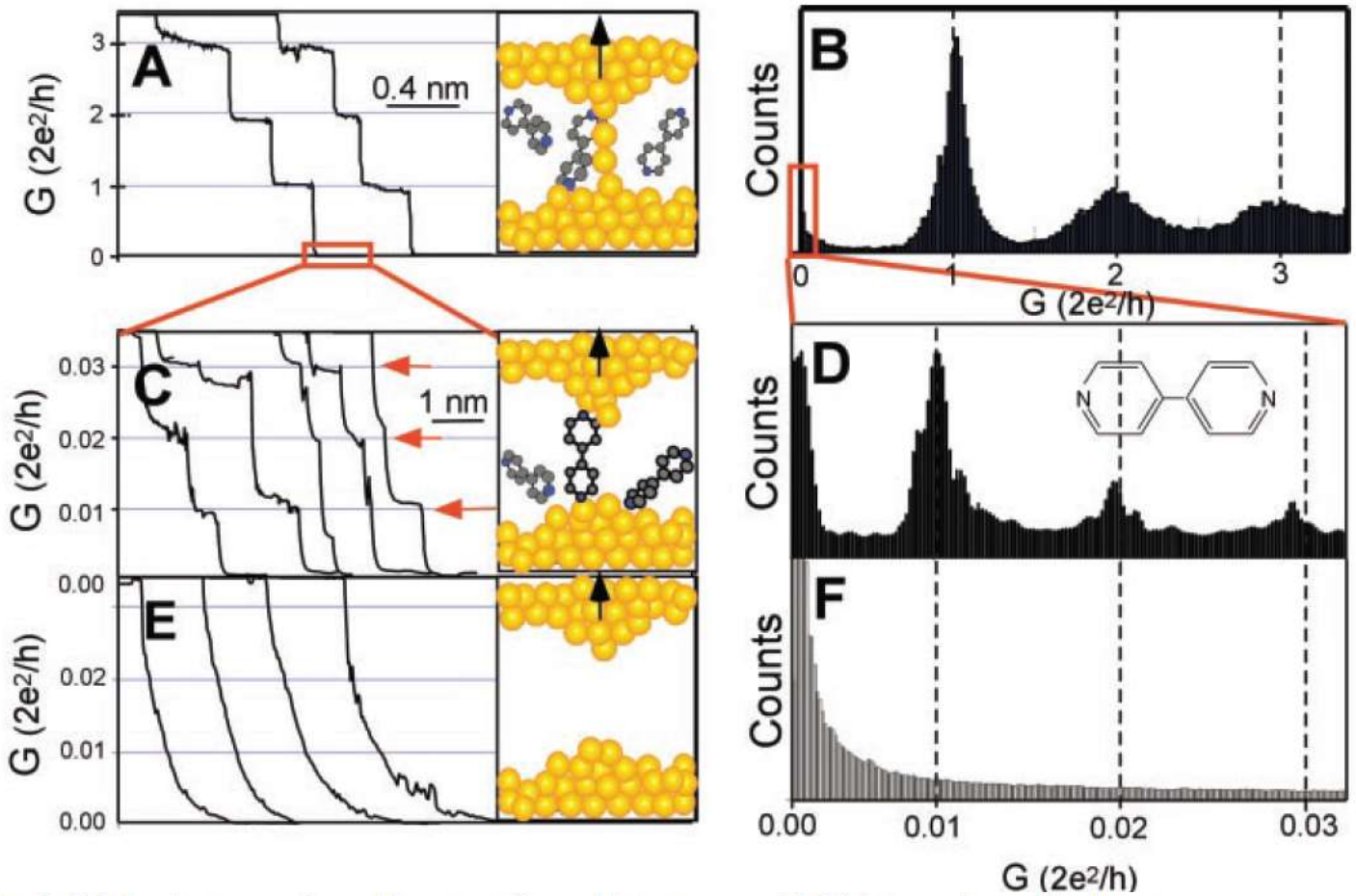
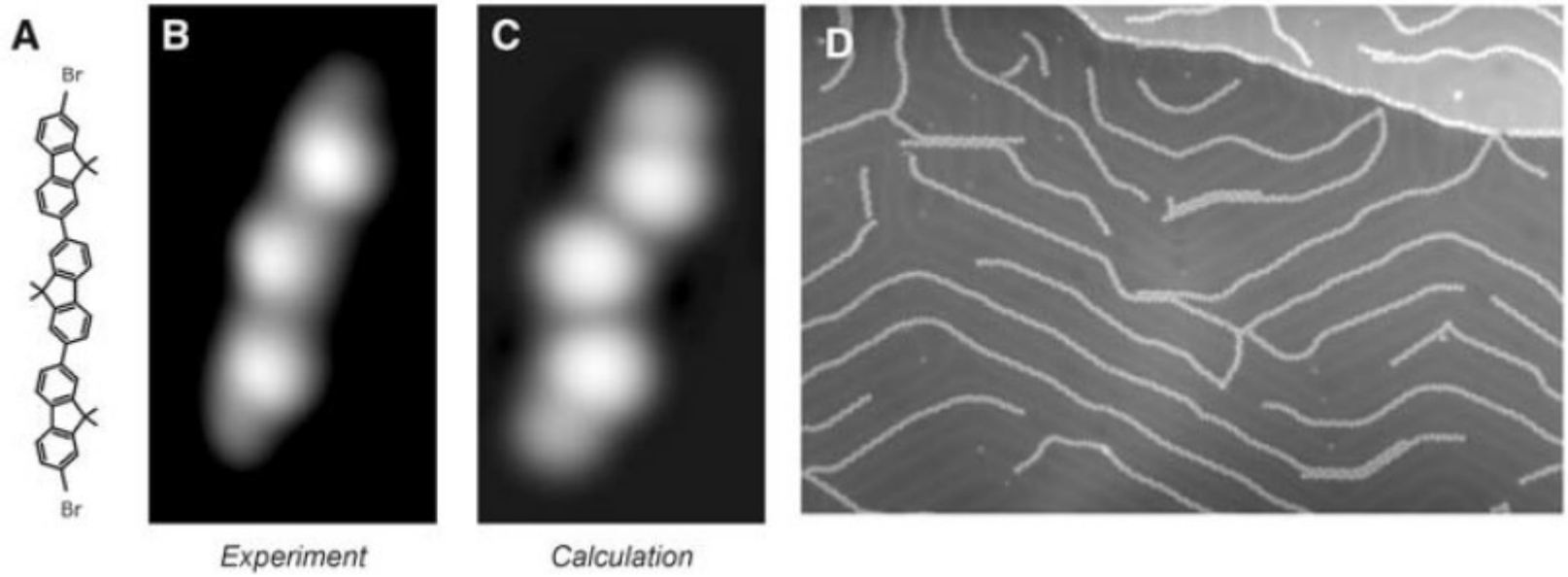
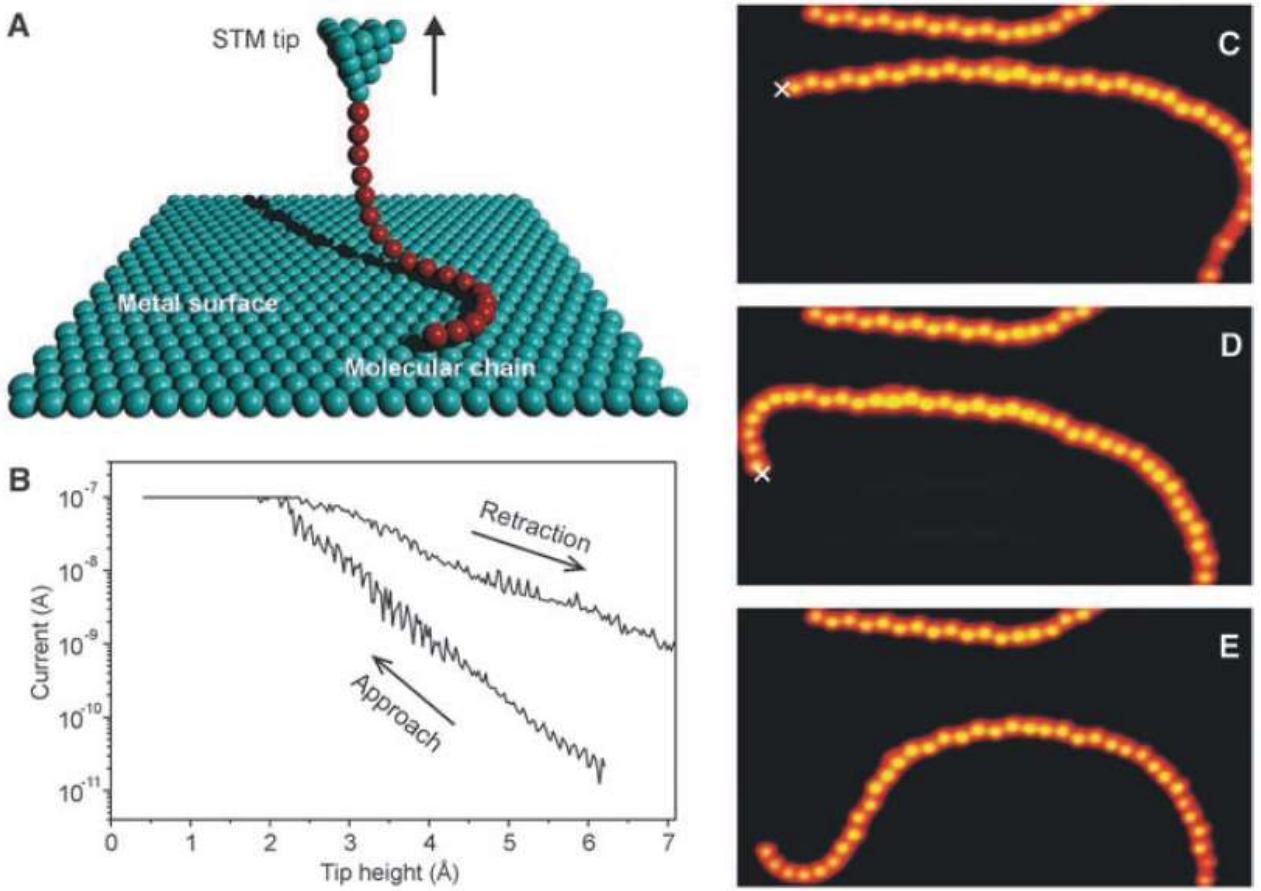


Fig. 1. (**A**) Conductance of a gold contact formed between a gold STM tip and a gold substrate decreases in quantum steps near multiples of G_0 ($= 2e^2/h$) as the tip is pulled away from the substrate. (**B**) A corresponding conductance histogram constructed from 1000 conductance curves as shown in (A) shows well-defined peaks near 1 G_0, 2 G_0, and 3 G_0 due to conductance quantization. (**C**) When the contact shown in (A) is completely broken, corresponding to the collapse of the last quantum step, a new series of conductance steps appears if molecules such as 4,4′ bipyridine are present in the solution. These steps are due to the formation of the stable molecular junction between the tip and the substrate electrodes. (**D**) A conductance histogram obtained from 1000 measurements as shown in (C) shows peaks near 1 ×, 2 ×, and 3 × 0.01 G_0 that are ascribed to one, two, and three molecules, respectively. (**E** and **F**) In the absence of molecules, no such steps or peaks are observed within the same conductance range.

$G_0 = \frac{2e^2}{h}$ è la conducibilità di un atomo di oro o di un filo di pochi atomi di oro. Gli step che si osservano nella conducibilità nei pannelli A e C sono misurati in funzione della distanza punta-campione e sono dovuti : (A) a punti di contatto punta-campione costituiti da 1,2,3 fili monoatomici; (C) a singole molecole come punto di contatto, in diverse configurazioni


A
Br
Br
B
C
D
Experiment
Calculation


A
STM tip
Metal surface
Molecular chain
B
Retraction
Approach
Current (A)
Tip height (Å)
C
D
E