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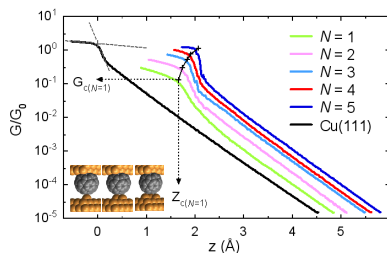
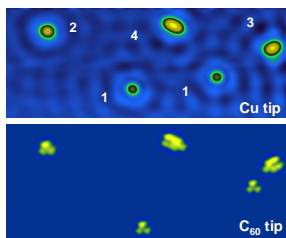
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The transport of charge through a conducting material depends on the intrinsic ability of the material to conduct current and on the charge injection efficiency at the contacts between the conductor and the electrodes.

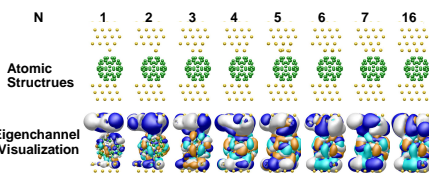
Scanning tunneling microscopy (STM) provides a way to explore single molecule junctions with atomic scale precision.

### Single molecule contacts to atomic-scale electrodes

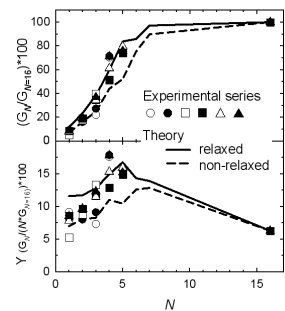
Images of Cu<sub>N</sub> (N=1..4) clusters on Cu(111)



Conductance traces of a C<sub>60</sub>-tip approached to atomically engineered Cu<sub>N</sub> (N=1..5) electrodes.



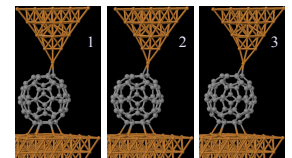
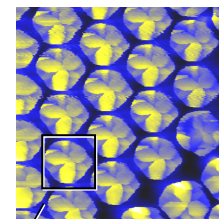
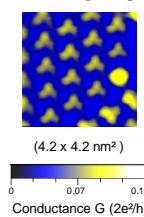
G. Schull, T. Frederiksen, A. Arnau, D. Sanchez-Portal, R. Berndt *Nature Nanotechnol.* 6, 23 (2011)



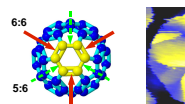
### Charge Injection through Single and Double Carbon Bonds

#### Contact imaging on C<sub>60</sub>

Tunnelling image

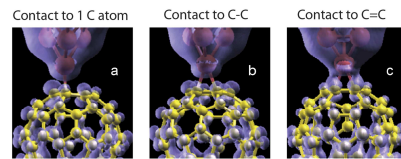
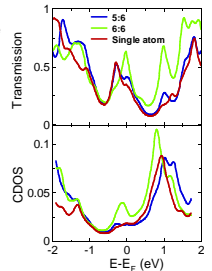


Calculated junctions geometries



Calculated Conductance map

Calculated Energy landscape



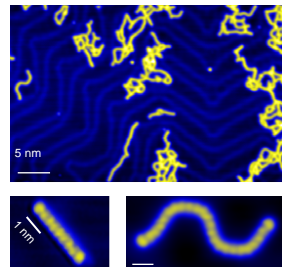
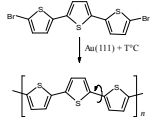
Isosurface plots of the density of states at the energy of the LUMO.

Anti-bonding

Bonding

### Oligothiophene nano-rings as electron resonators for whispering gallery modes

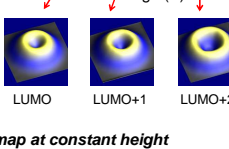
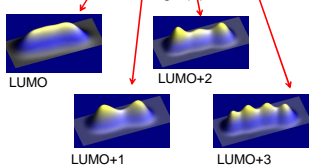
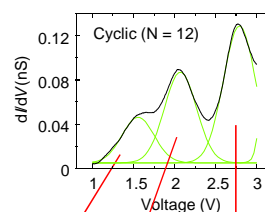
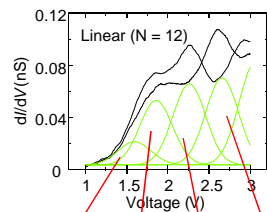
"On-surface polymerization" of conductive and flexible nano-wires



Images STM  
I = 0.1 nA, V = 0.1 V

Linear 12-thiophene

Cyclic 12-thiophene

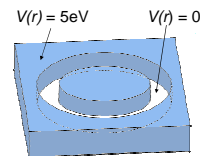


dI/dV map at constant height

1D box with fixed boundary conditions

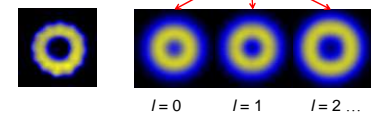
1D box with BVK conditions

Analytical 2D model :  
col. Hervé Bulou



$$-\frac{\hbar^2}{2m^*} \frac{d^2 u(r)}{dr^2} + \left[ V(r) + \frac{\hbar^2}{2m^* r^2} \left( l^2 - \frac{1}{4} \right) \right] u(r) = \epsilon u(r)$$

~ centrifugal force

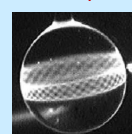


Dome of St-Paul's Cathedral  
Φ = 34 m



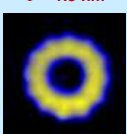
Acoustic whispering gallery

Glass sphere  
Φ = 300 μm



Optical whispering gallery

Cyclic 12-thiophene  
Φ = 1.3 nm



Electronic whispering gallery

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G. Schull, Y. J. Dappe, C. Gonzalez, H. Bulou, R. Berndt *Nano Lett.* 11, 3142 (2011)

T. Frederiksen, F. Scheurer, V. Speisser, G. Schull. *Submitted.*

G. Reecht, H. Bulou, F. Scheurer, V. Speisser, B. Carrière, F. Mathevet, G. Schull. *Submitted*