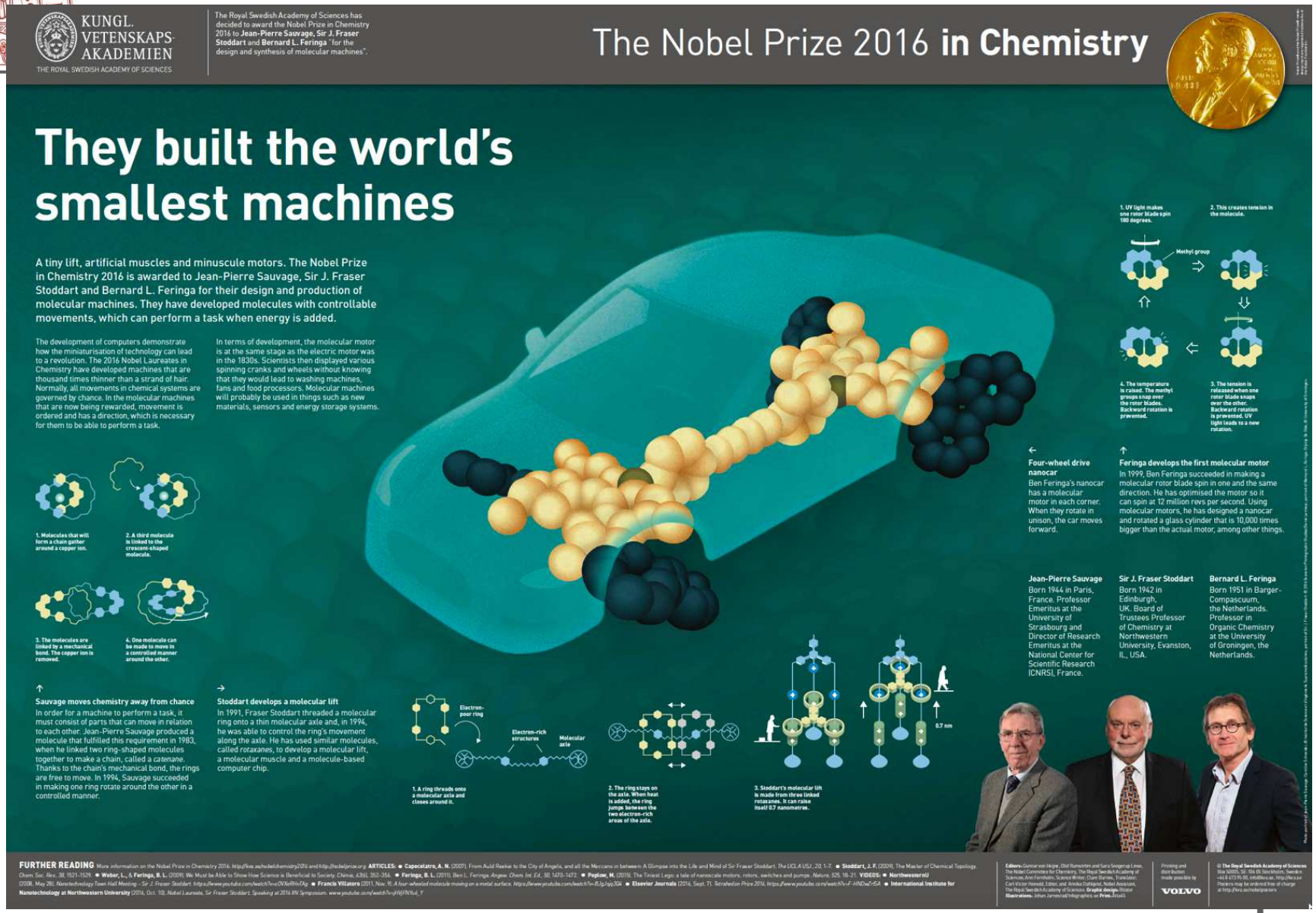
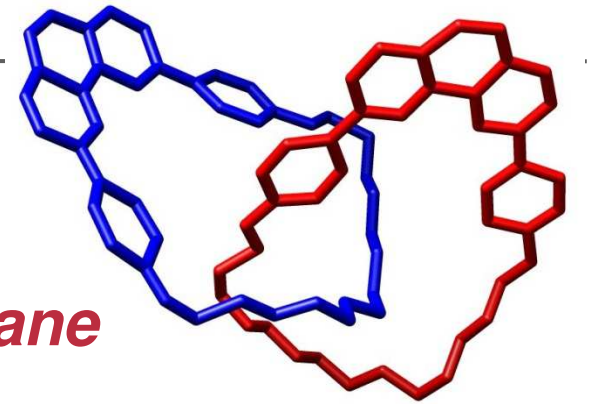
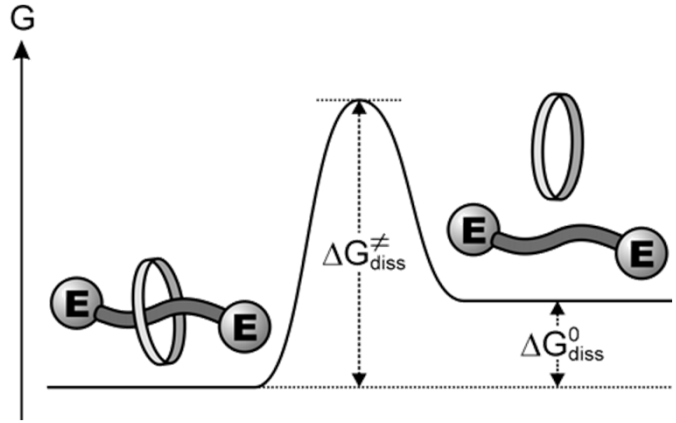
Supramolecular Chemistry: Molecular Machines



Mechanically-interlocked architectures

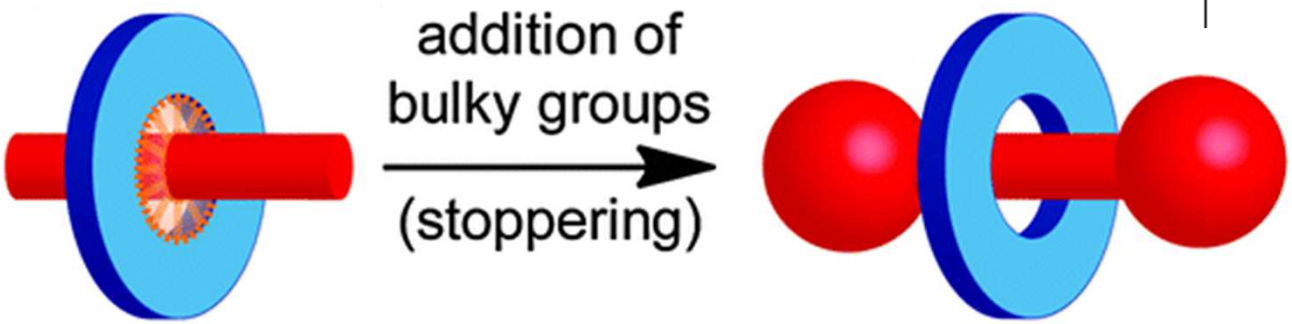


Catenane

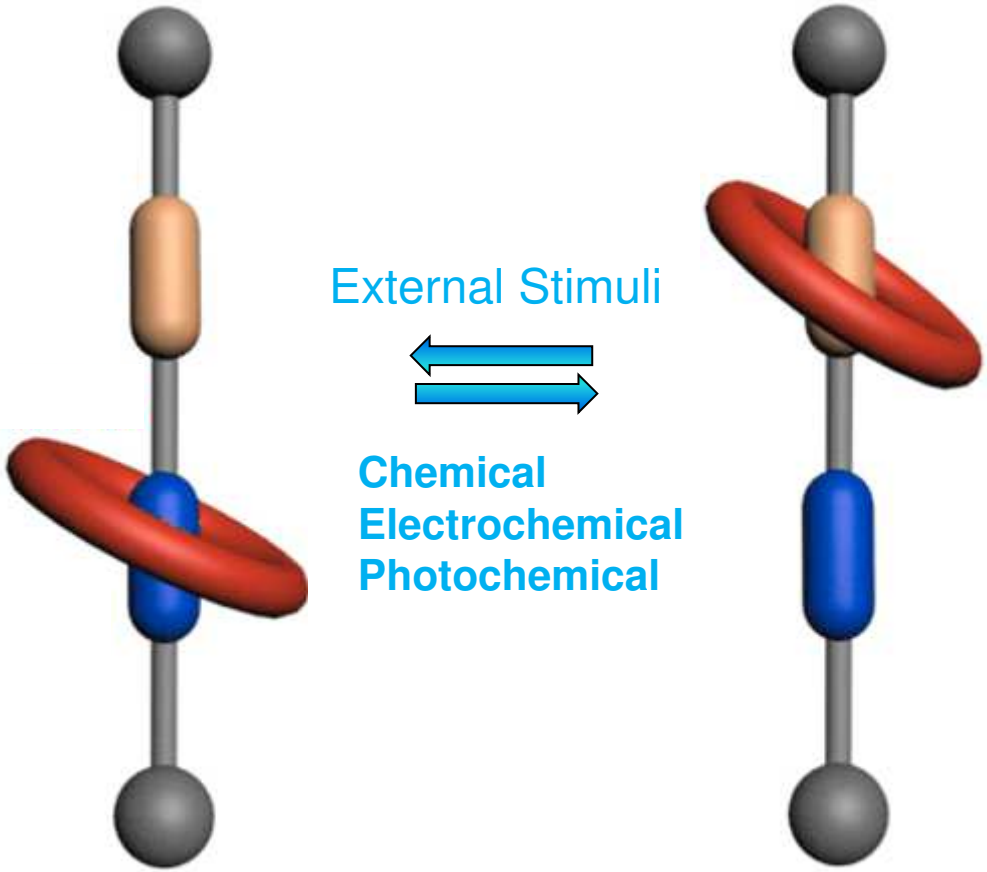


Pseudorotaxane

Rotaxane

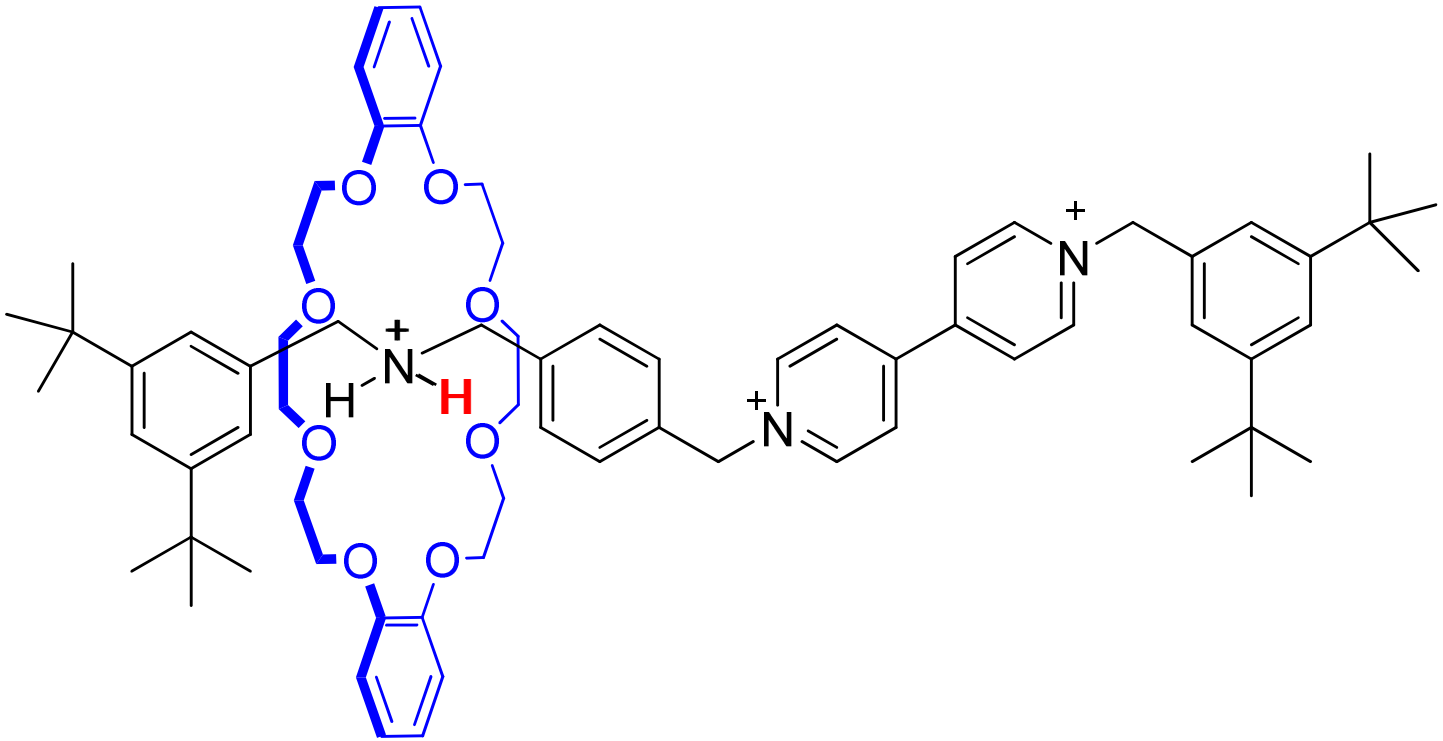


Will MIMs ever be of any practical use?



Switches and Logic Gates

An acid-base controllable molecular shuttle



V. Balzani, J. F. Stoddart et al. JACS, 1998, 120, 11932

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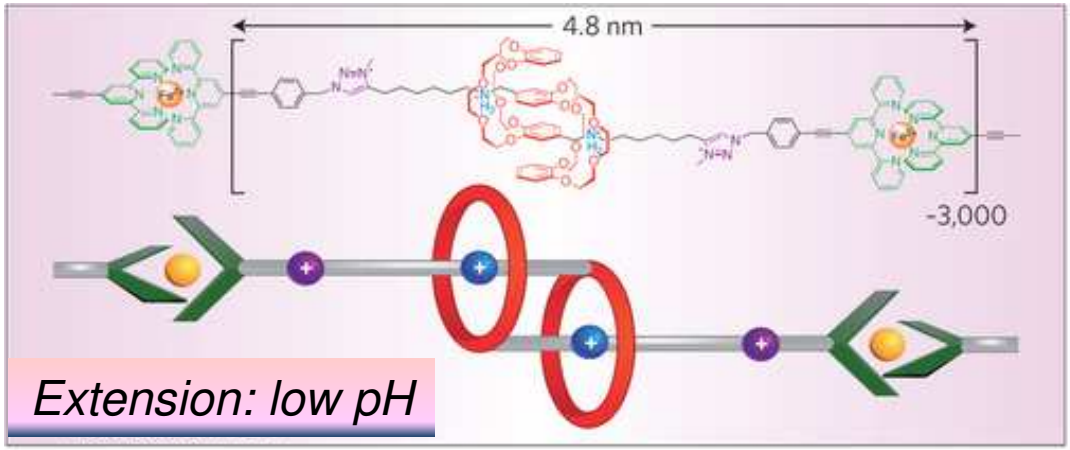
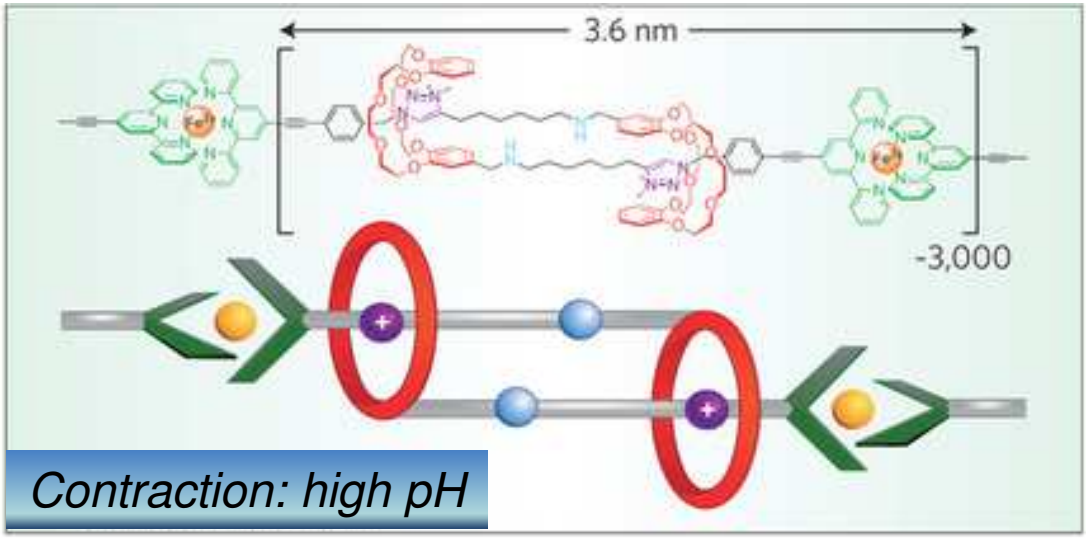
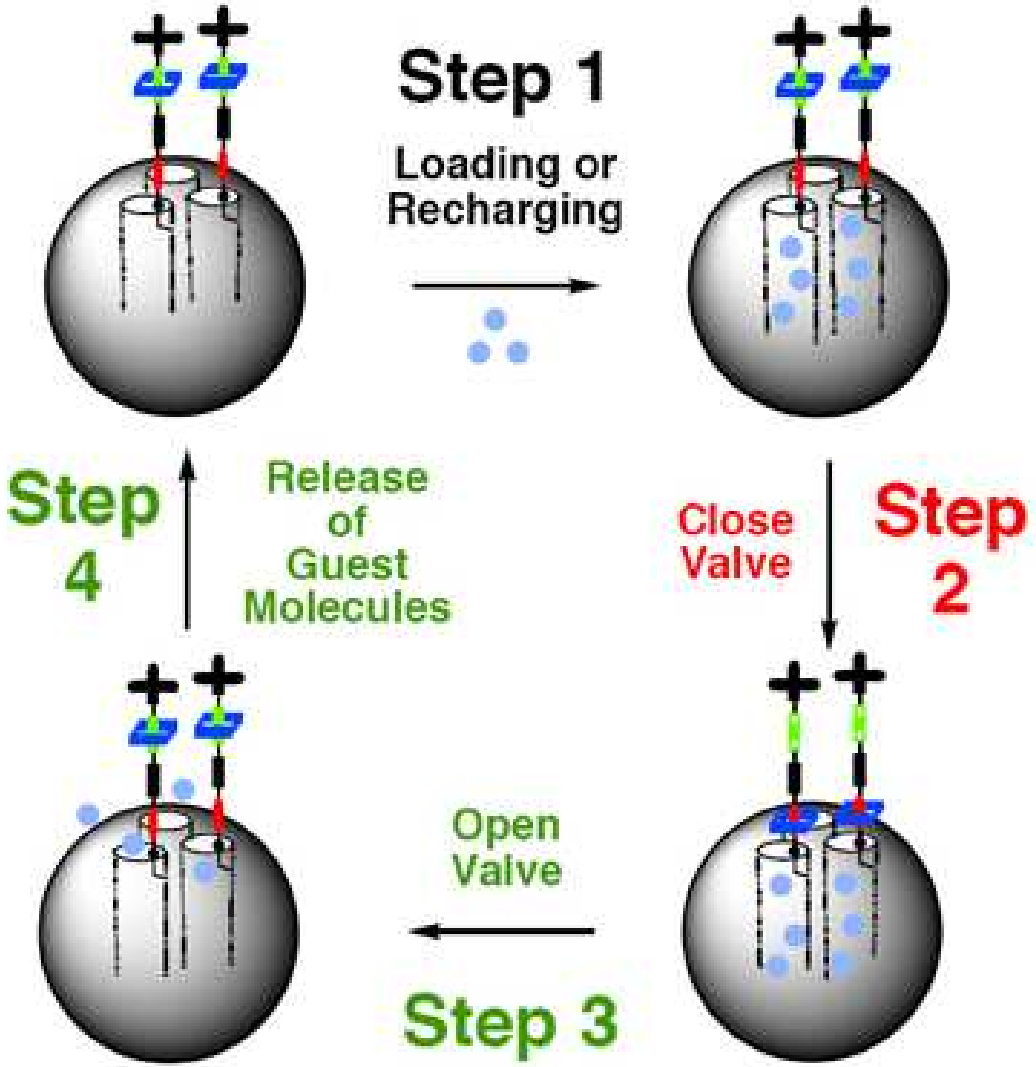




Artificial Muscles

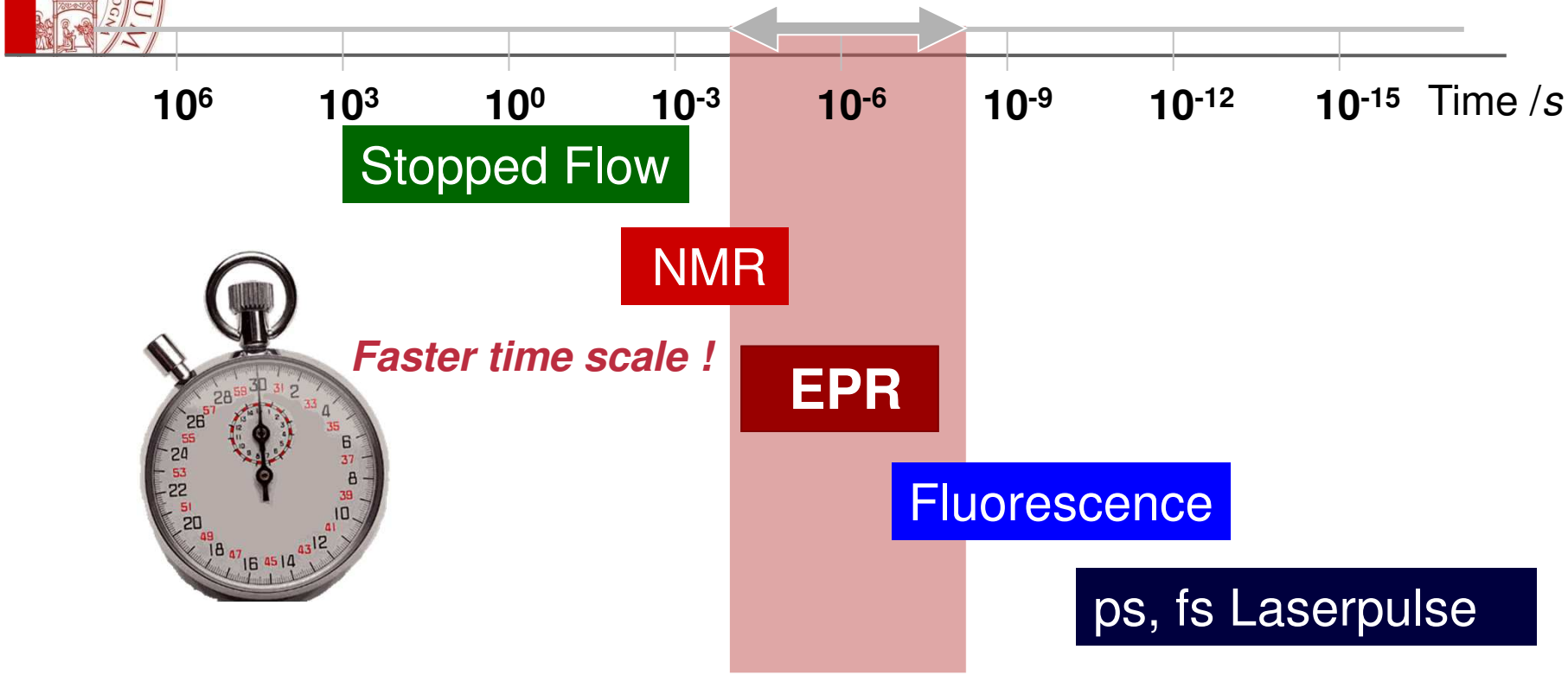
Will MIMs ever be of any practical use?

Molecular Nanovalves



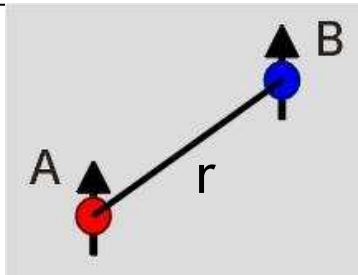
EPR (Risonanza di spin elettronico)
Il cugino povero della RMN!

Why EPR ?



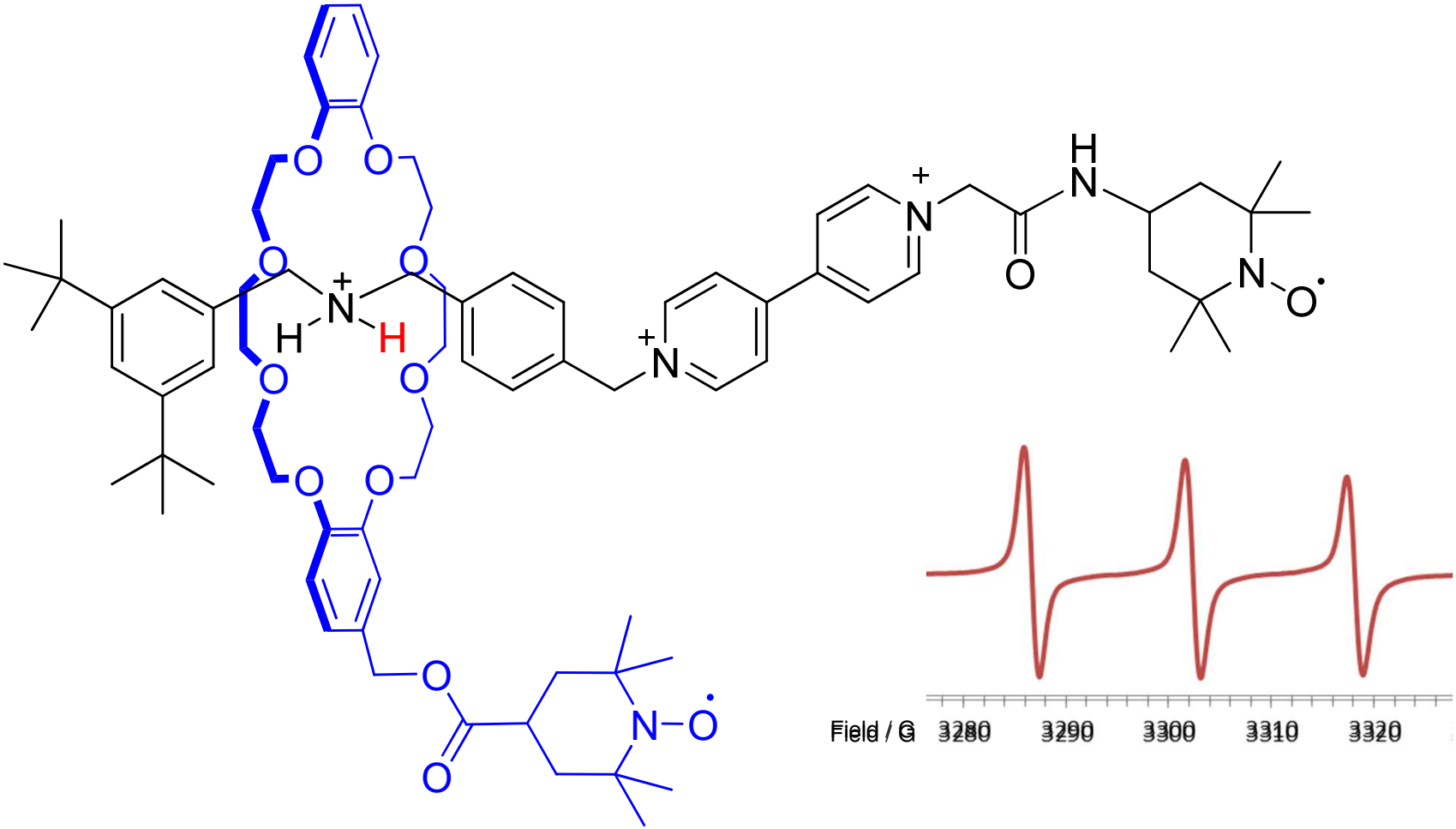
Faster time scale !

Classical range Range of chemical kinetics Spectroscopic range

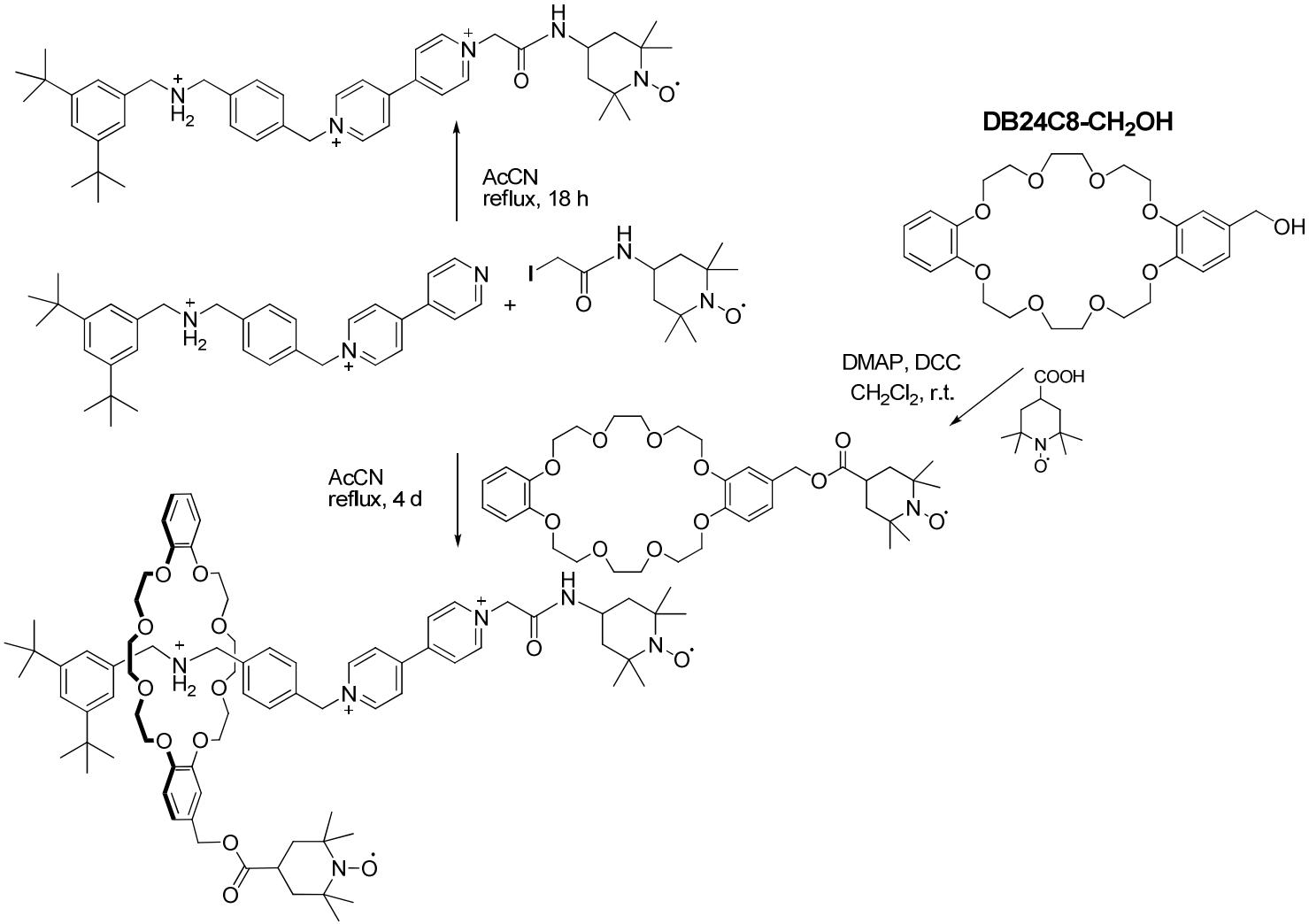


By EPR it is possible to obtain structural information at the nanometer scale

Probing the movement by EPR

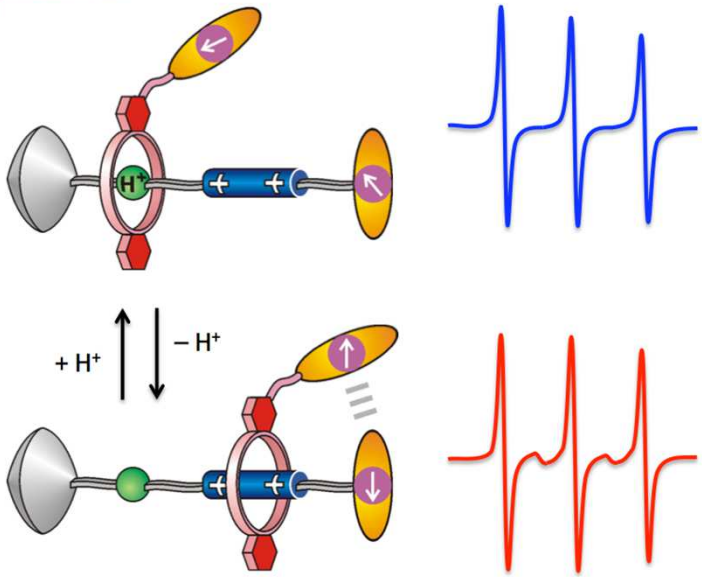


A novel spin labeled macrocycle



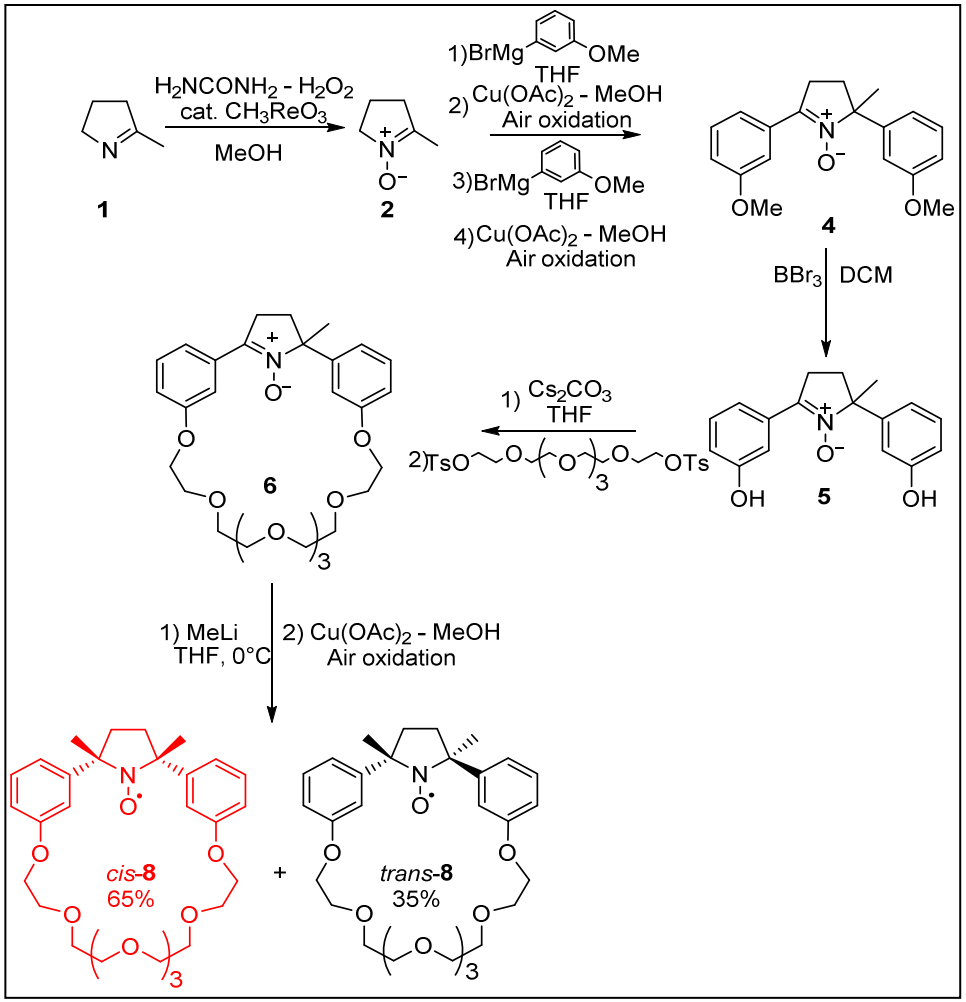
Valentina Bleve

Una macchina molecolare che trasporta «spin»

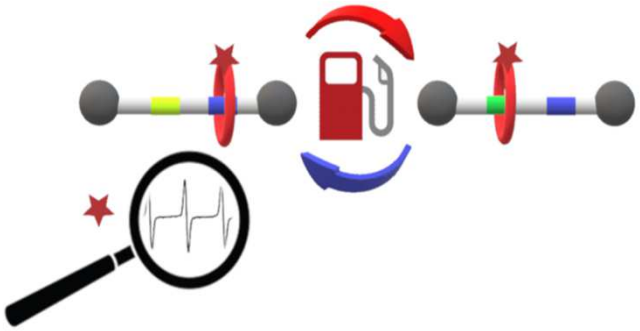


A novel spin labeled macrocycle

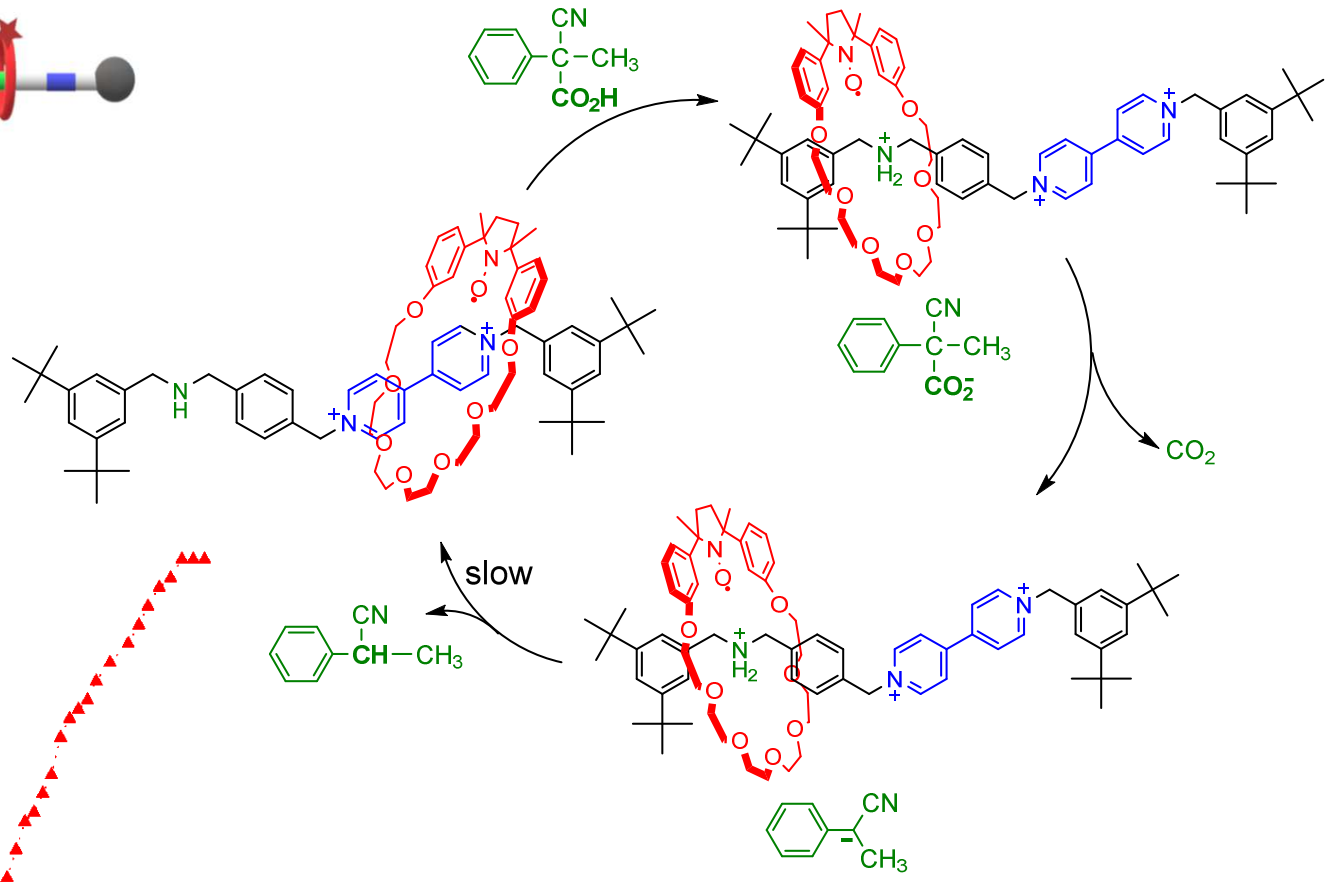
Cecilia Poderi

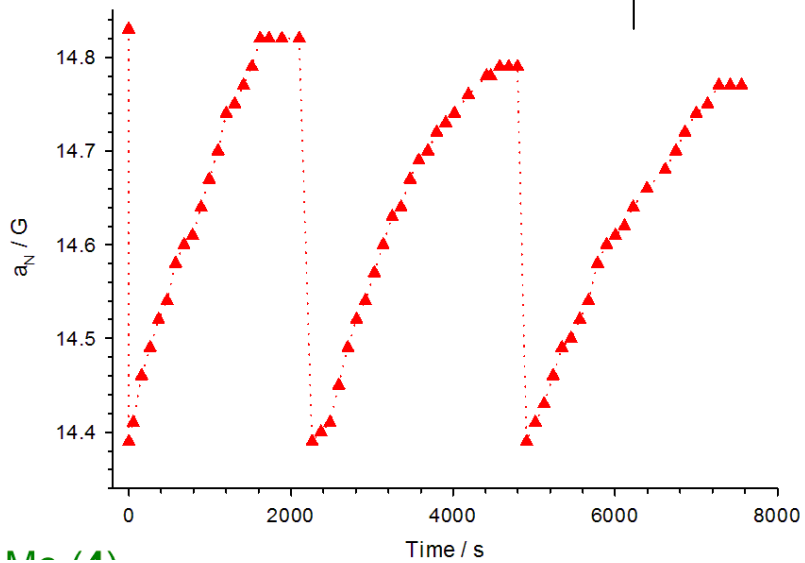


Back and forth switching motions monitored by EPR



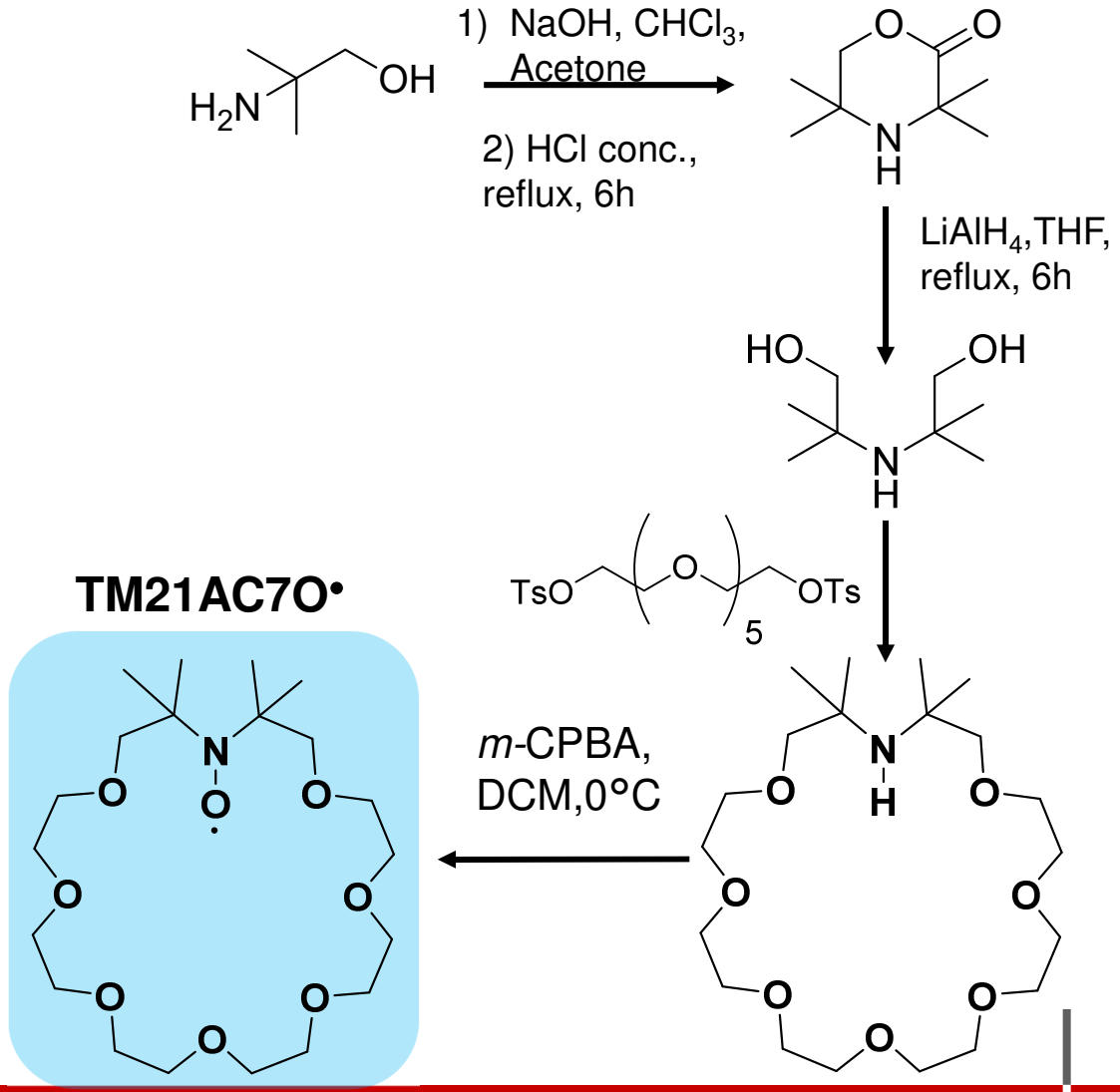
J. Org. Chem., **2019,** *84*, 9364



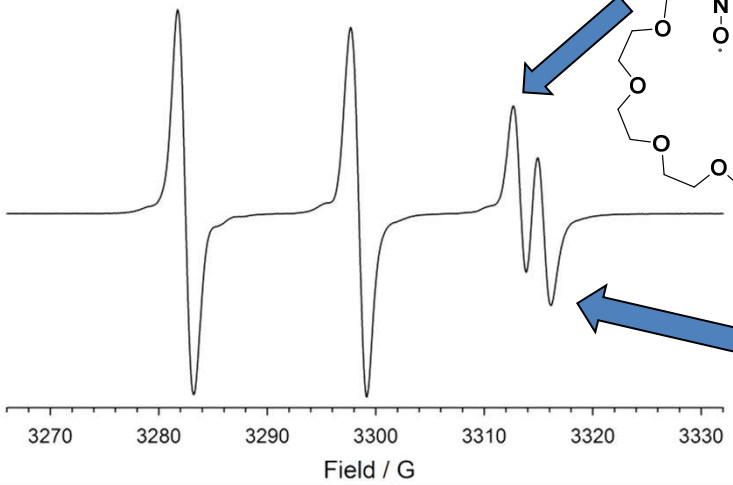


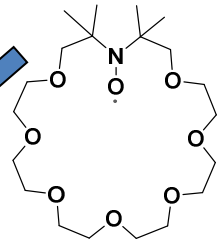
Improving EPR discrimination….

Iago Neira



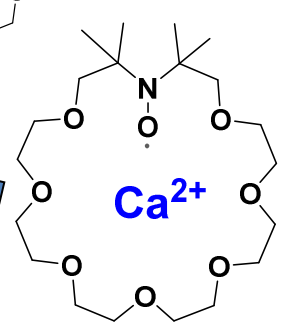
EPR discrimination of metal cations





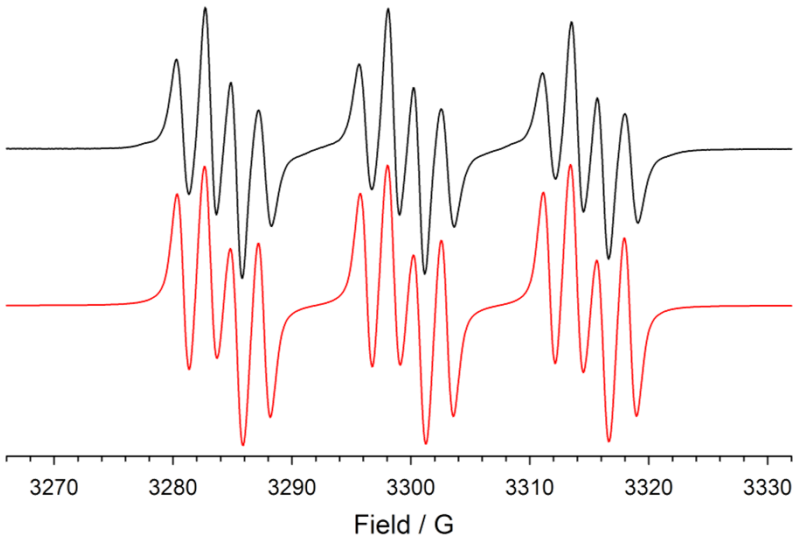
a(N)=15.31 G

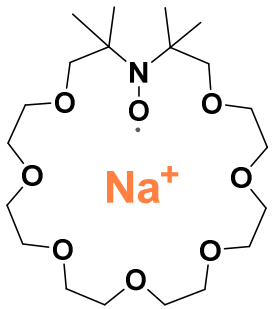
K_{eq}=75 M^{-1} (in acetone rt)



a(N)=16.61 G

Δg=–0.006





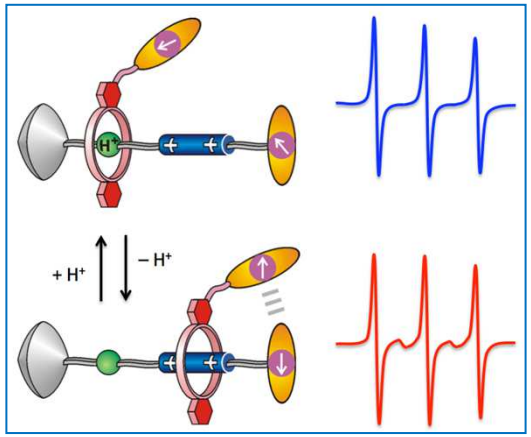
a(N)=15.75 G

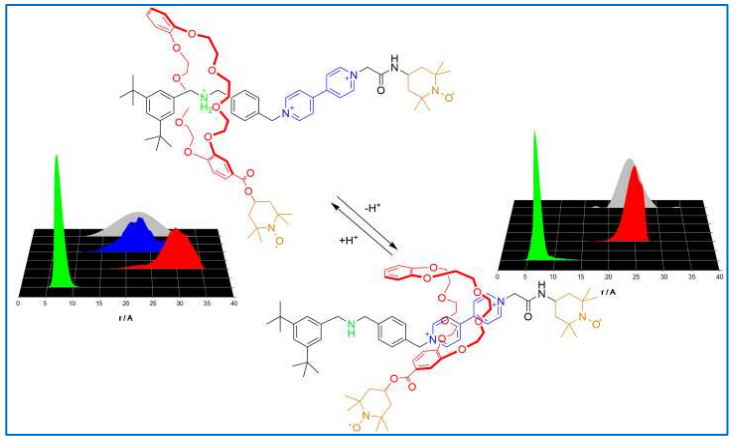
a(^{23}Na)=2.26 G (I=3/2, 100%)

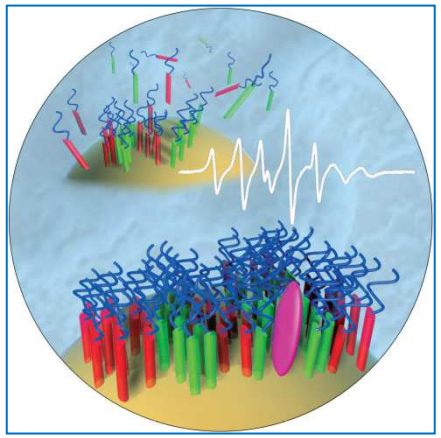
Sistemi supramolecolari paramagnetici

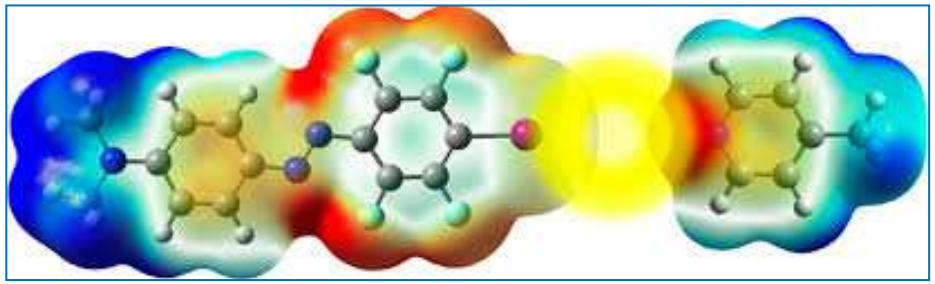
Prof. Marco Lucarini, Prof. ssa Elisabetta Mezzina, Dott. ssa Paola Franchi

Durata 6 mesi









Si sviluppano *strategie sintetiche* per l'inserimento di uno o più *centri radicalici* in sistemi *supramolecolari* come i complessi host-guest, le macchine molecolari, le nanoparticelle protette, ecc.

La presenza di centri radicalici permette di studiare le strutture sintetizzate non solo con le tecniche tradizionali, *1D e 2D NMR, ESI-MS, spettroscopia UV*, ma anche con la *spettroscopia EPR (risonanza paramagnetica elettronica)*, tecnica in grado di fornire informazioni circa la dinamica di movimento, la forza delle interazioni e le distanze tra i vari componenti dell'assemblaggio molecolare.

(per informazioni dettagliate vedi *Eur. J. Org. Chem.* **2020, 2995–3008**).