Novosibirsk State University

НИОХ F N

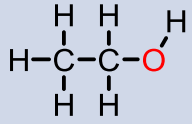
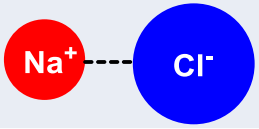
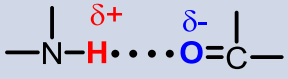
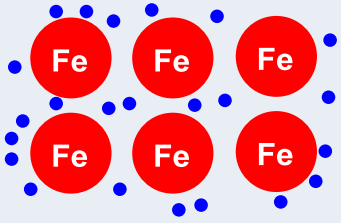
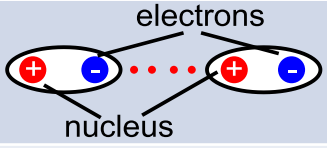
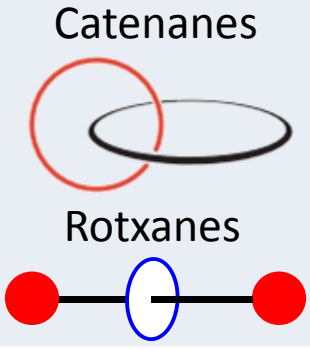
Research Group for Organic Electronic Materials GROM

MOLECULAR MACHINES

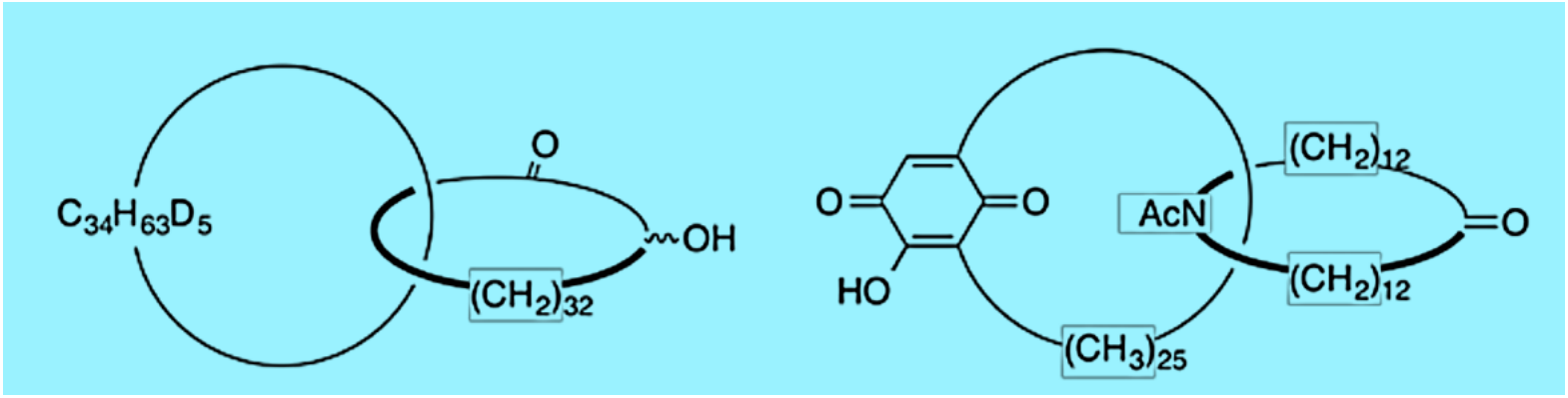
Evgeny A. Mostovich

OPEN LECTURE

19 October 2016, Novosibirsk, Russia

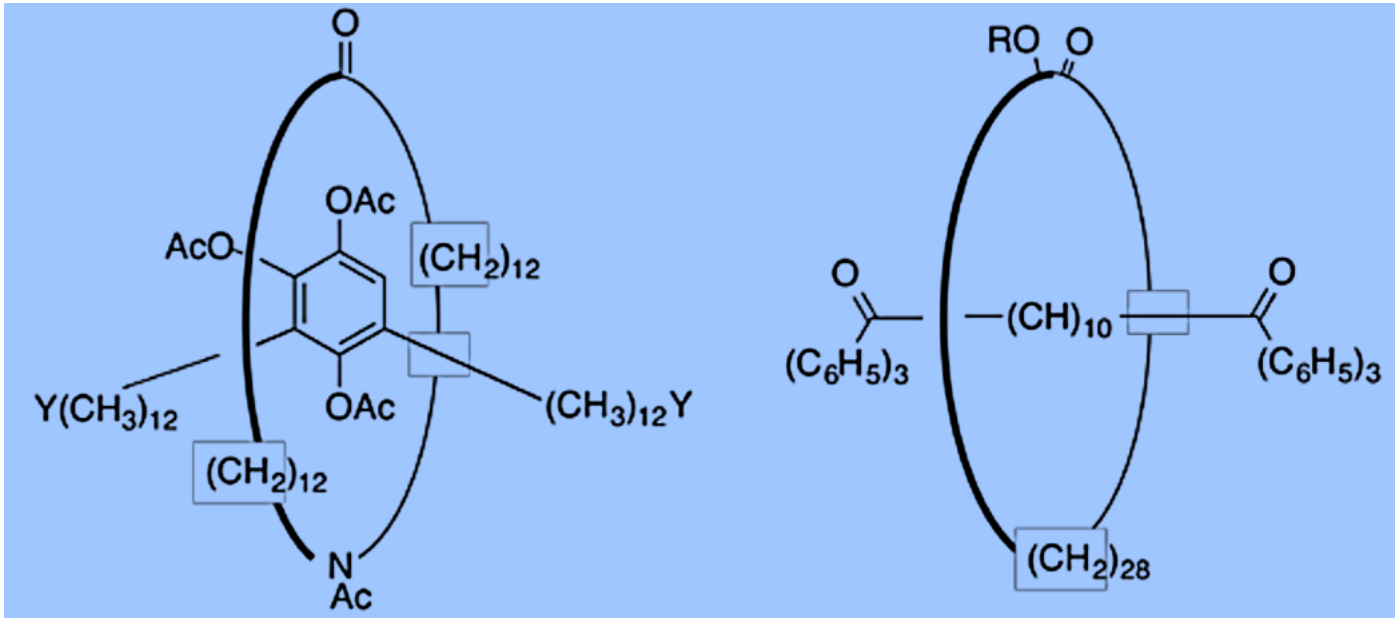
Chemical bond	Nature of interaction	Structure	Bond energy, kcal/mol
Covalent bond	Sharing of electron pair		50-150
Ionic bond	Coulomb attraction		50-100
Hydrogen bond	Sharing of **H** atom		8-42
Metallic bond	Metal ions with free electrons		
Weak bond	Van der Waals attraction		1-8
"Mechanical bond"	Topological entanglement covalent bonds		

Catenanes
< 1%



Wasserman, E. The Preparation of Interlocking Rings: A Catenane. *J. Am. Chem. Soc.* **1960**, *82* (16), 4433–4434.
Schill, G.; Lüttringhaus, A. The Preparation of Catena Compounds by Directed Synthesis. *Angew. Chem. Int. Ed.* **1964**, 3 (8), 546–547.

Rotoxanes



Schill, G.; Zollenkopf, H. Rotaxan-Verbindungen, I. *Justus Liebigs Ann. Chem.* **1969**, *721* (1), 53–74.

Tetrahedron Letters,Vol.24,No.46,pp 5095-5098,1983 0040-4039/83 $3.00 + .00
Printed in Great Britain

UNE NOUVELLE FAMILLE DE MOLECULES : LES METALLO-CATENANES

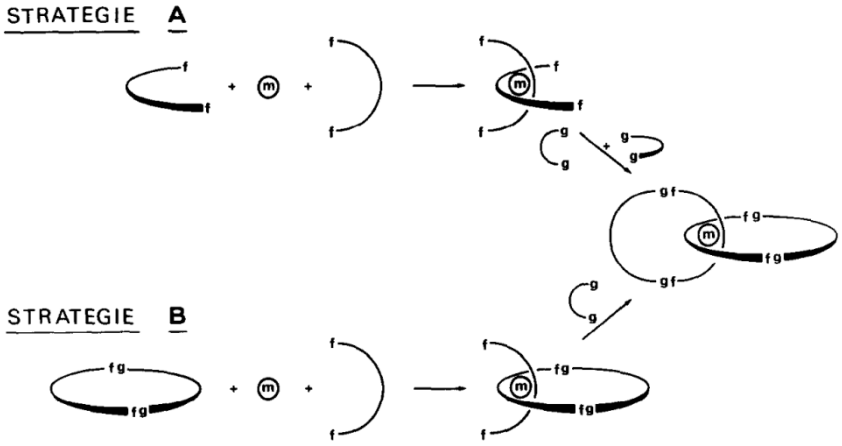
* * * *

C.O. DIETRICH-BUCHECKER, J.P. SAUVAGE

Laboratoire de Chimie Organo-Minérale, ERA N° 265 au CNRS,
Institut de Chimie, 1, rue Blaise Pascal, 67008 Strasbourg Cédex, France.

J.P. KINTZINGER

Laboratoire de Chimie Organique Physique, ERA N° 265 au CNRS,
Institut Le Bel, 4, rue Blaise Pascal, 67000 Strasbourg, France.



Jean-Pierre Sauvage

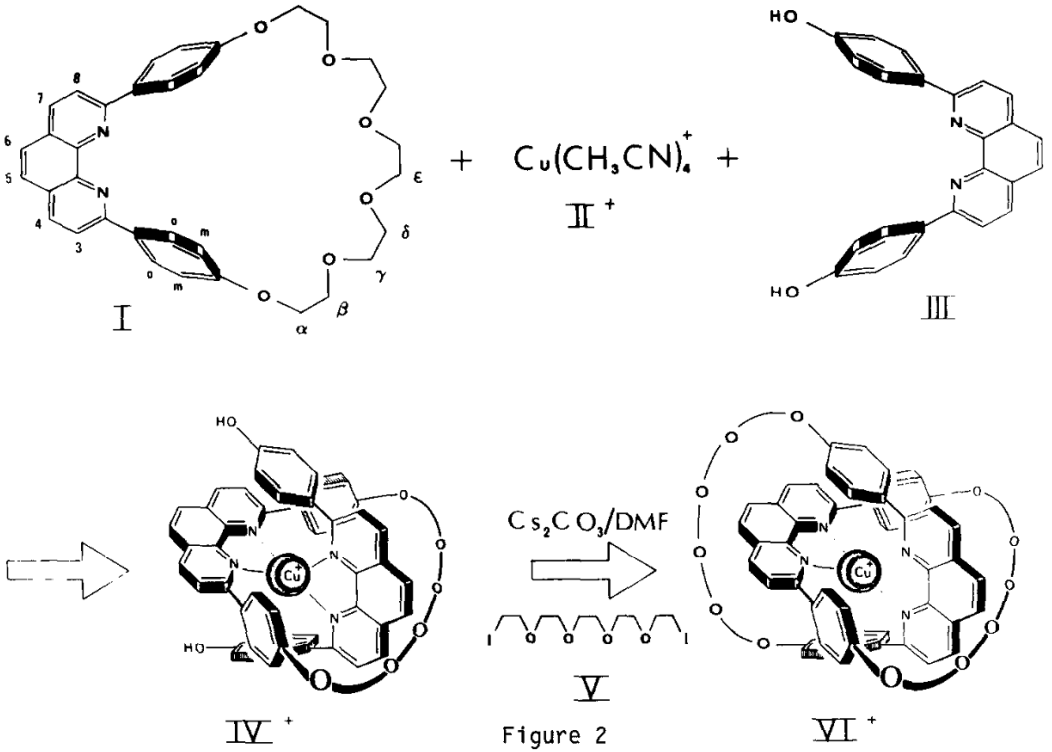
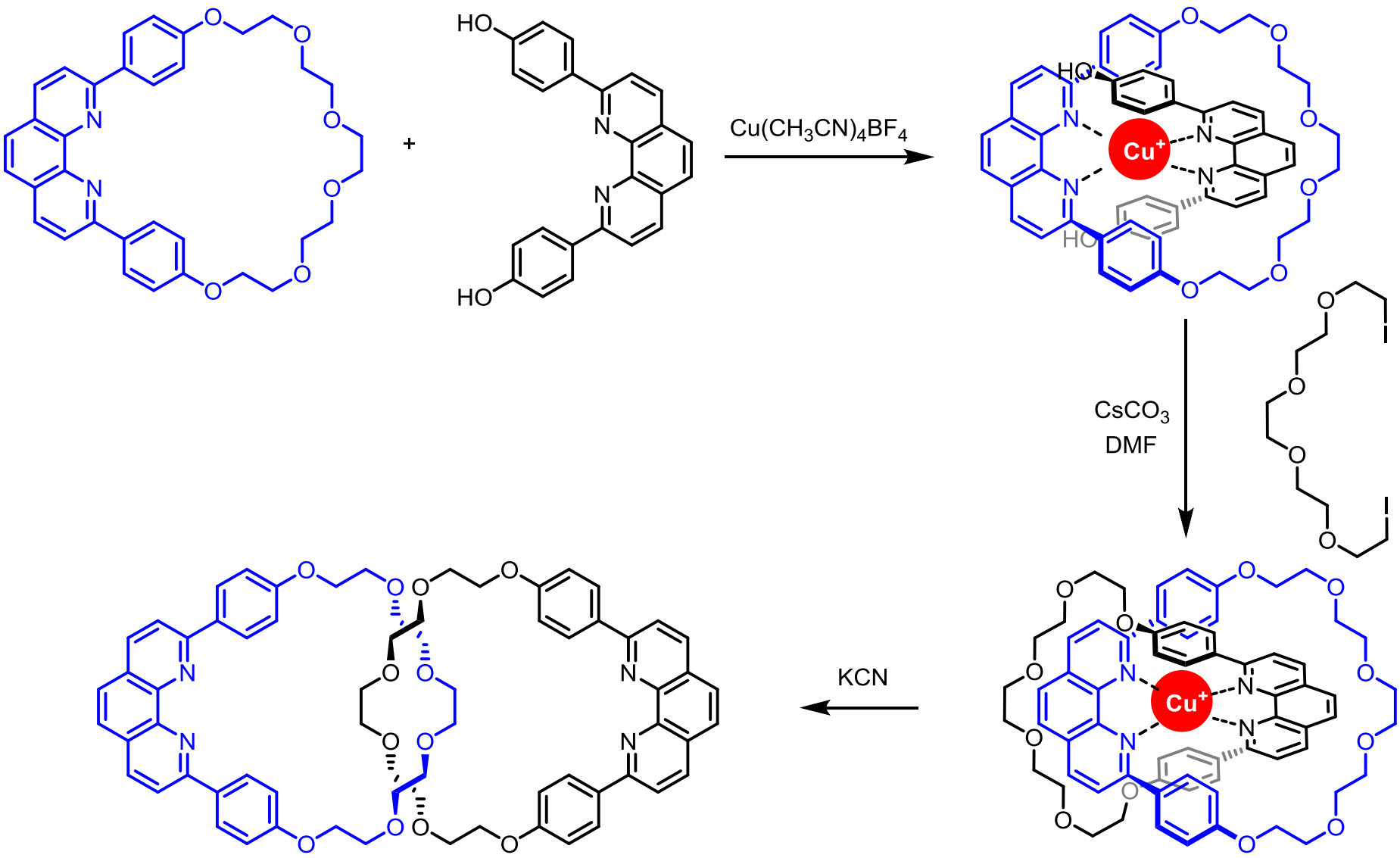
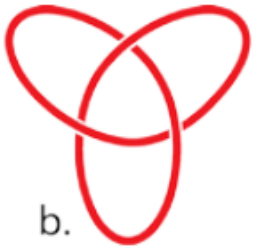


Figure 2

Dietrich-Buchecker, C. O.; Sauvage, J. P.; Kintzinger, J. P. Une nouvelle famille de molécules: Les métallo-caténanes. *Tetrahedron Lett.* 1983, *24* (46),

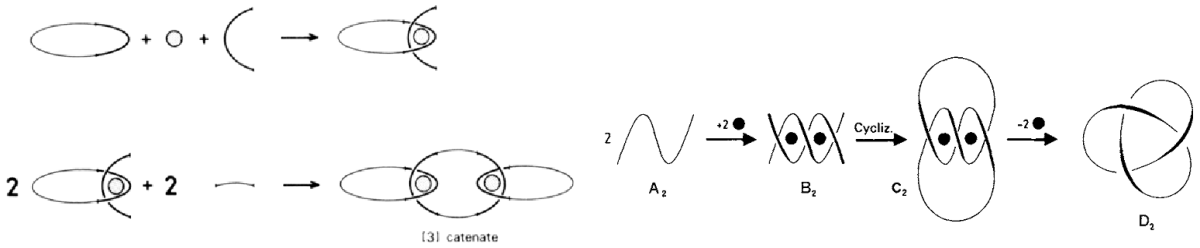

HO
HO
+
Cu(CH3CN)4BF4
Cu+
CsCO3
DMF
KCN
Cu+

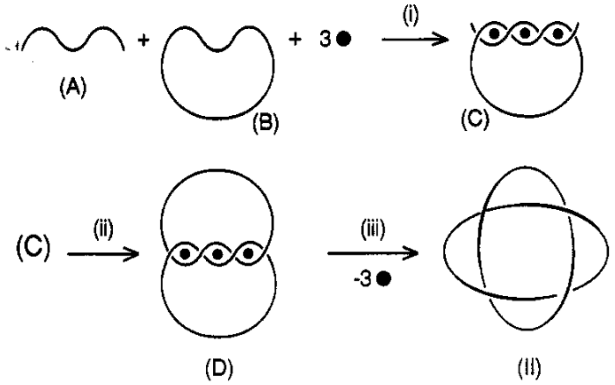
[3]Catenane

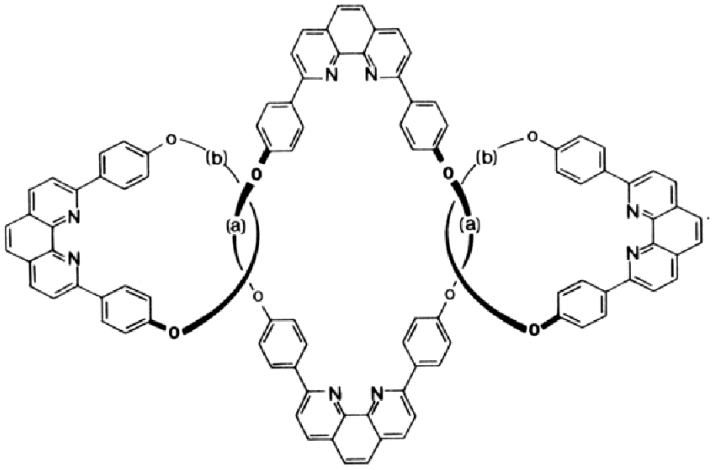


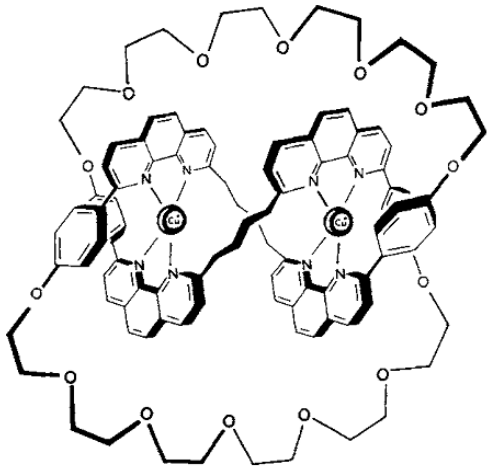
Trefoil knot

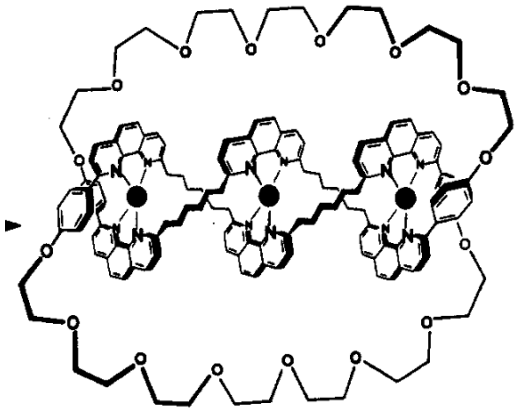
Solomon link



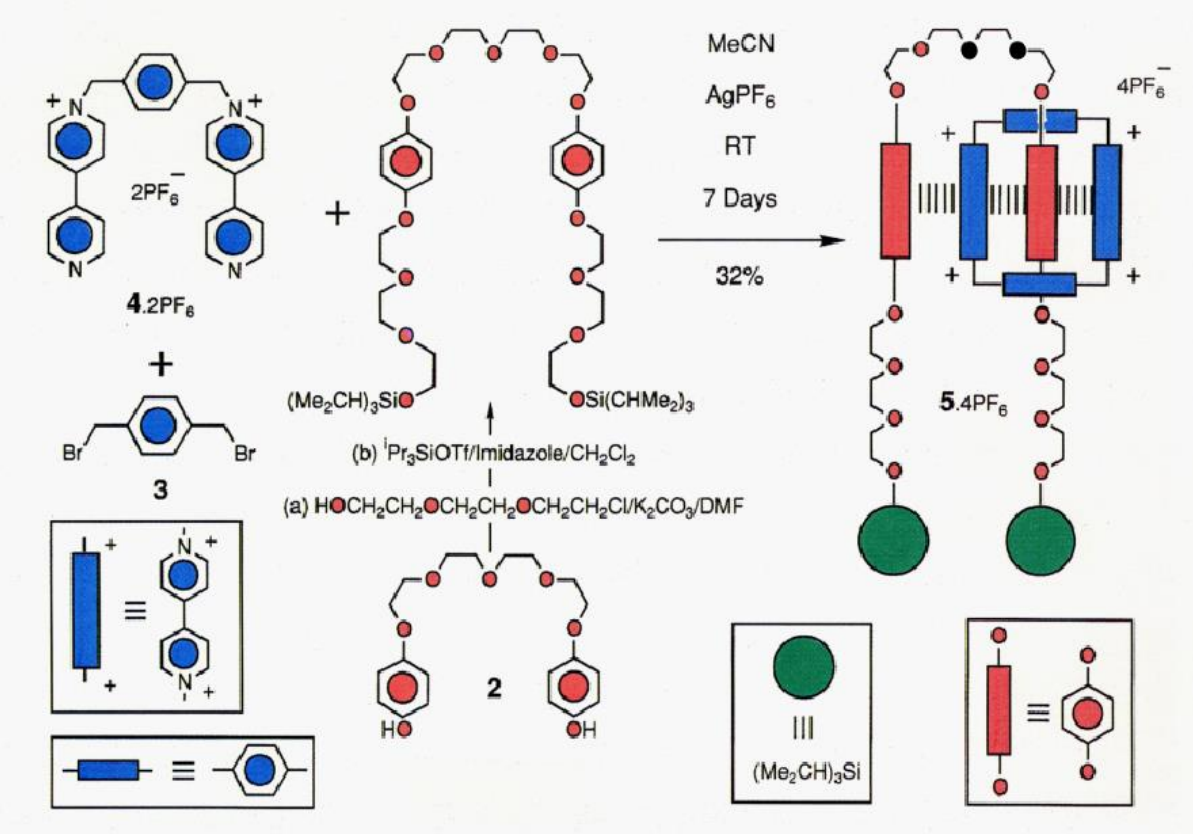




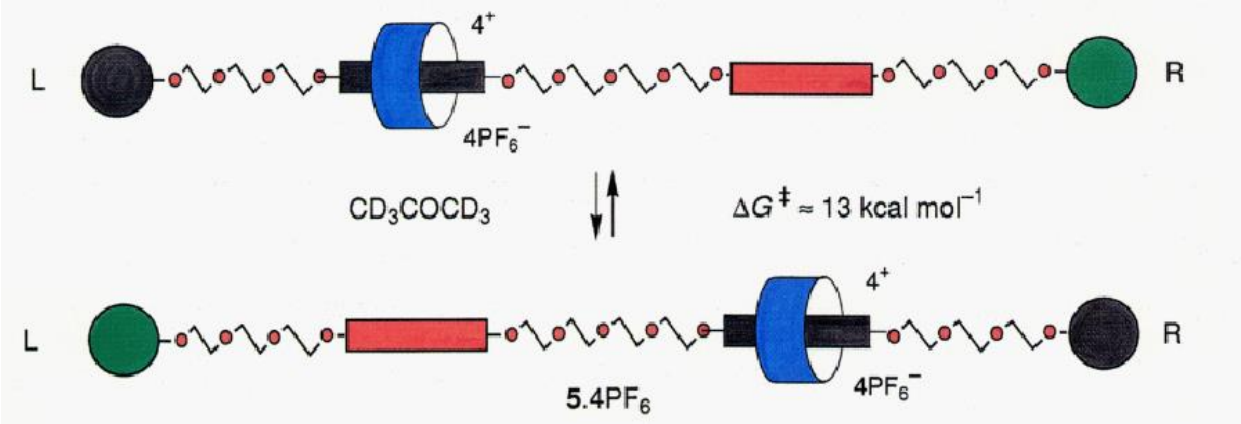




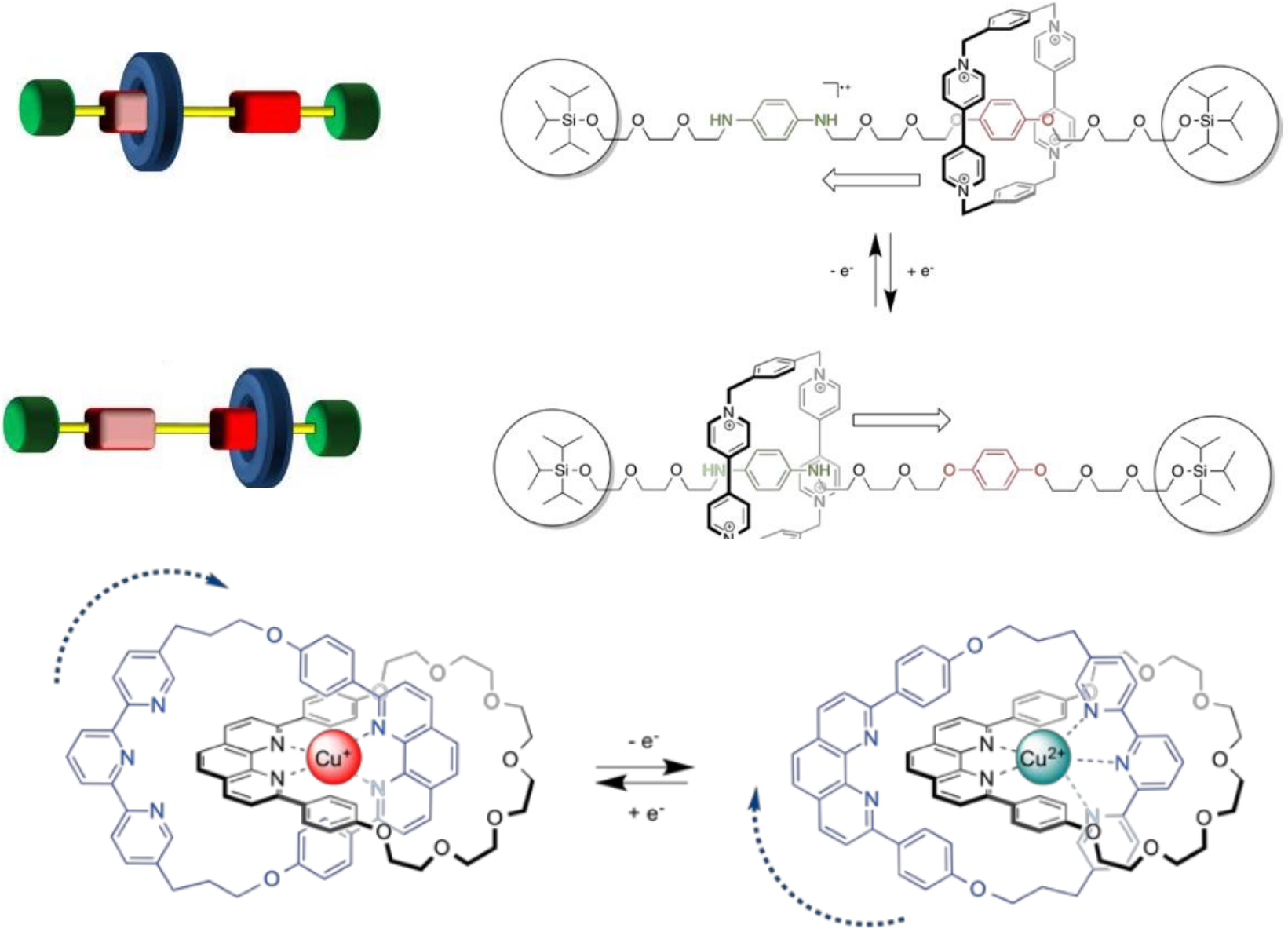
[1]J.P. Sauvage, J. Weiss, Synthesis of biscopper(I) [3]-catenates: multiring interlocked coordinating systems, J. Am. Chem. Soc. 107 (1985) 6108–6110. doi:10.1021/ja00307a049.
[2]C.O. Dietrich-Buchecker, J.-P. Sauvage, A Synthetic Molecular Trefoil Knot, Angew. Chemie Int. Ed. English. 28 (1989) 189–192. doi:10.1002/anie.198901891.



James Fraser Stoddart



P.L. Anelli, N. Spencer, J.F. Stoddart, A molecular shuttle, J. Am. Chem. Soc. 113 (1991) 5131–5133. doi:10.1021/ja00013a096.



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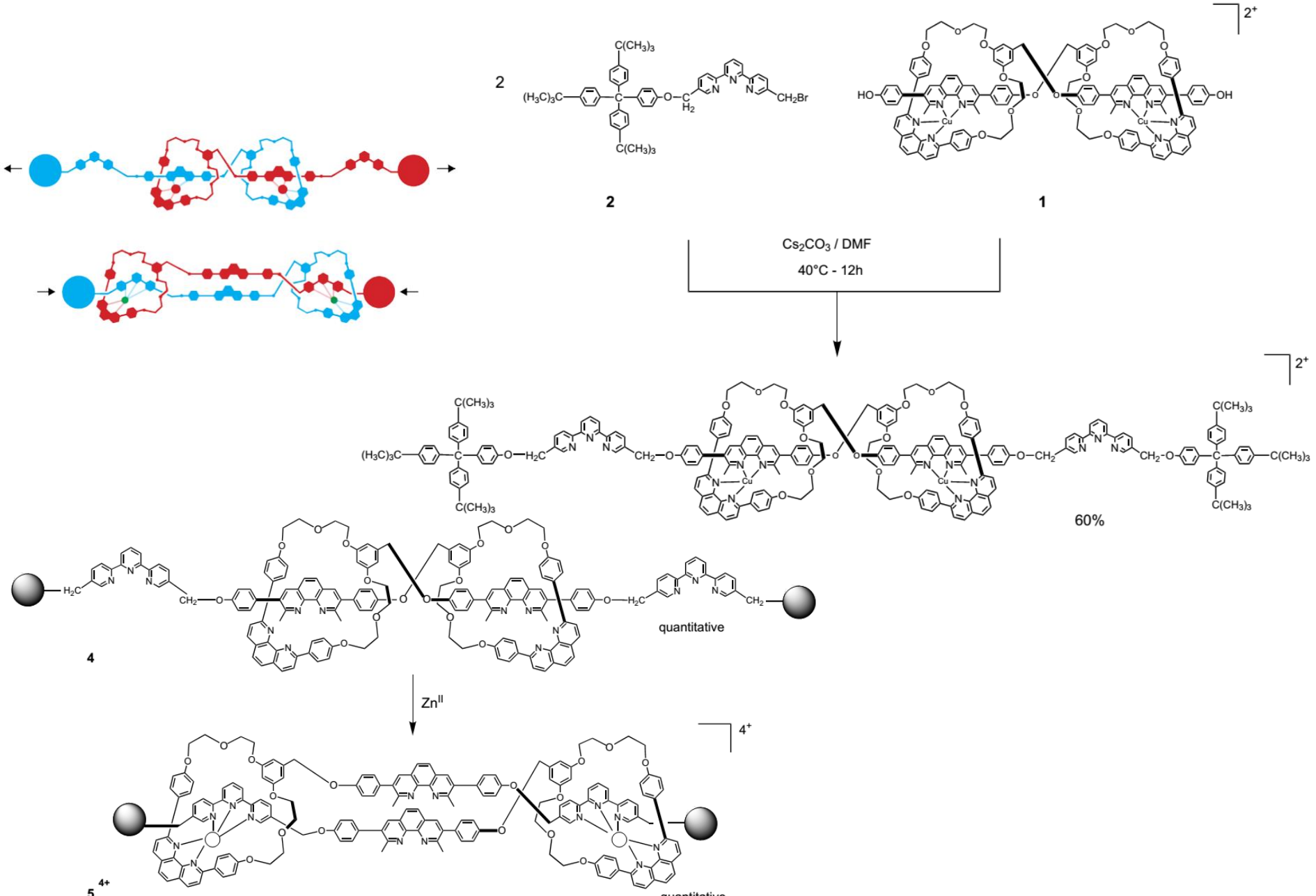
Extension and contraction in a daisy-chain rotaxane structure



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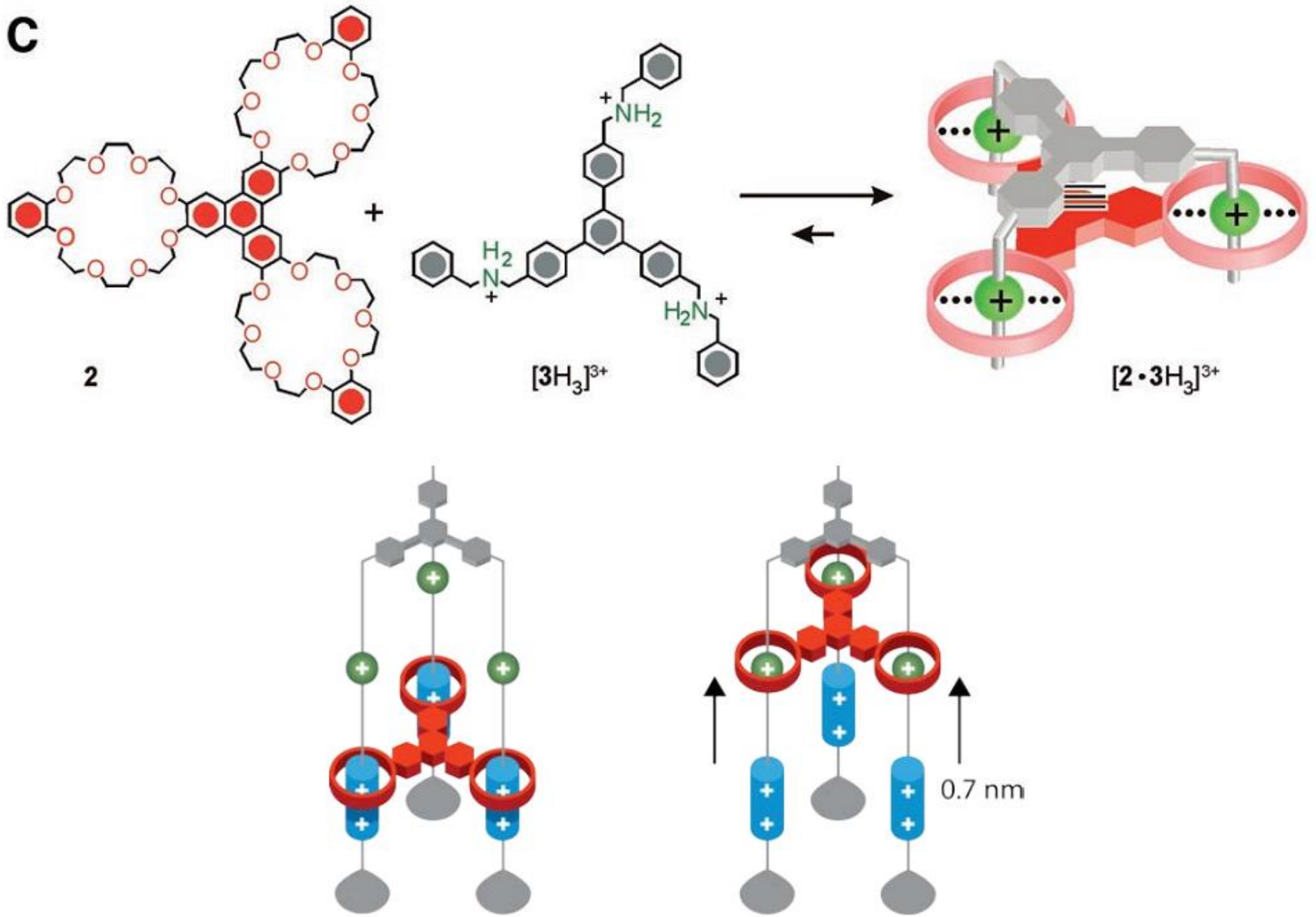
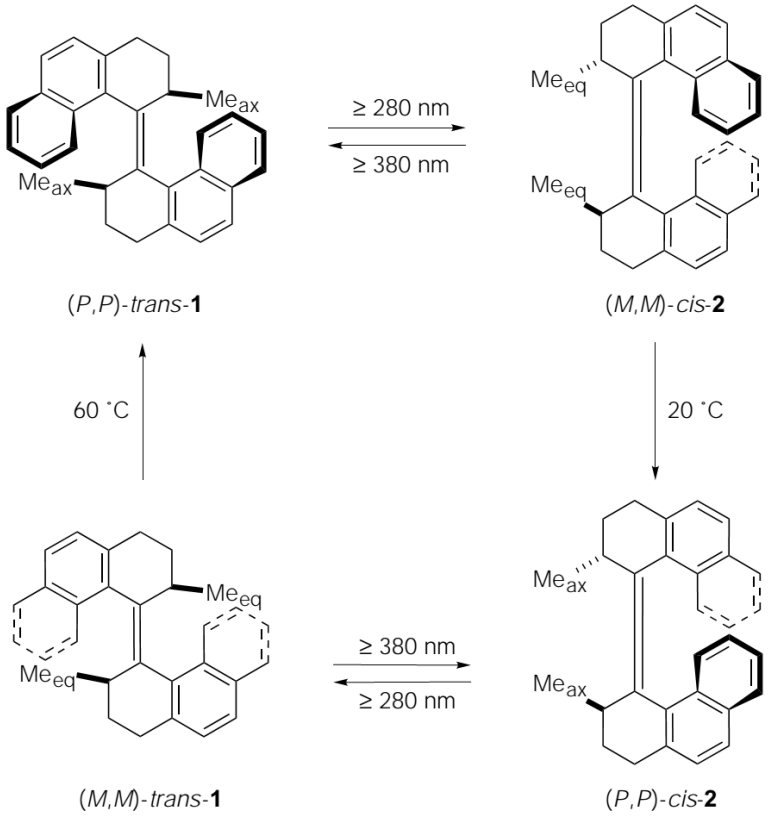
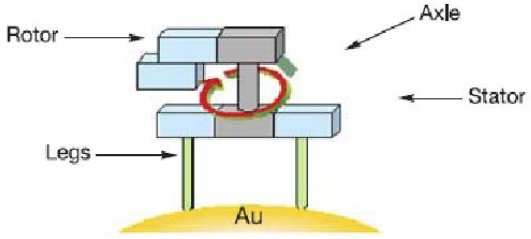
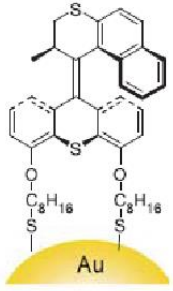


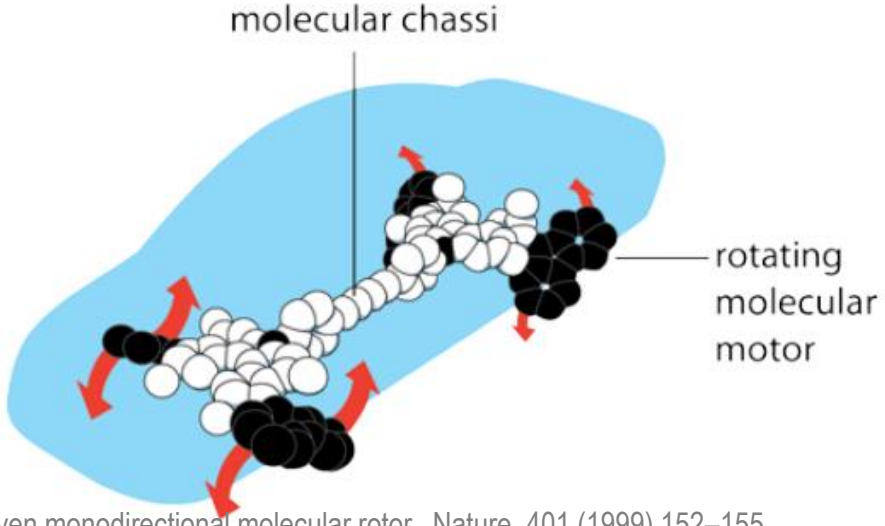
J.D. Badjic, A Molecular Elevator, Science (80-.). 303 (2004) 1845–1849. doi:10.1126/science.1094791.

Bernard (Ben) L. Feringa









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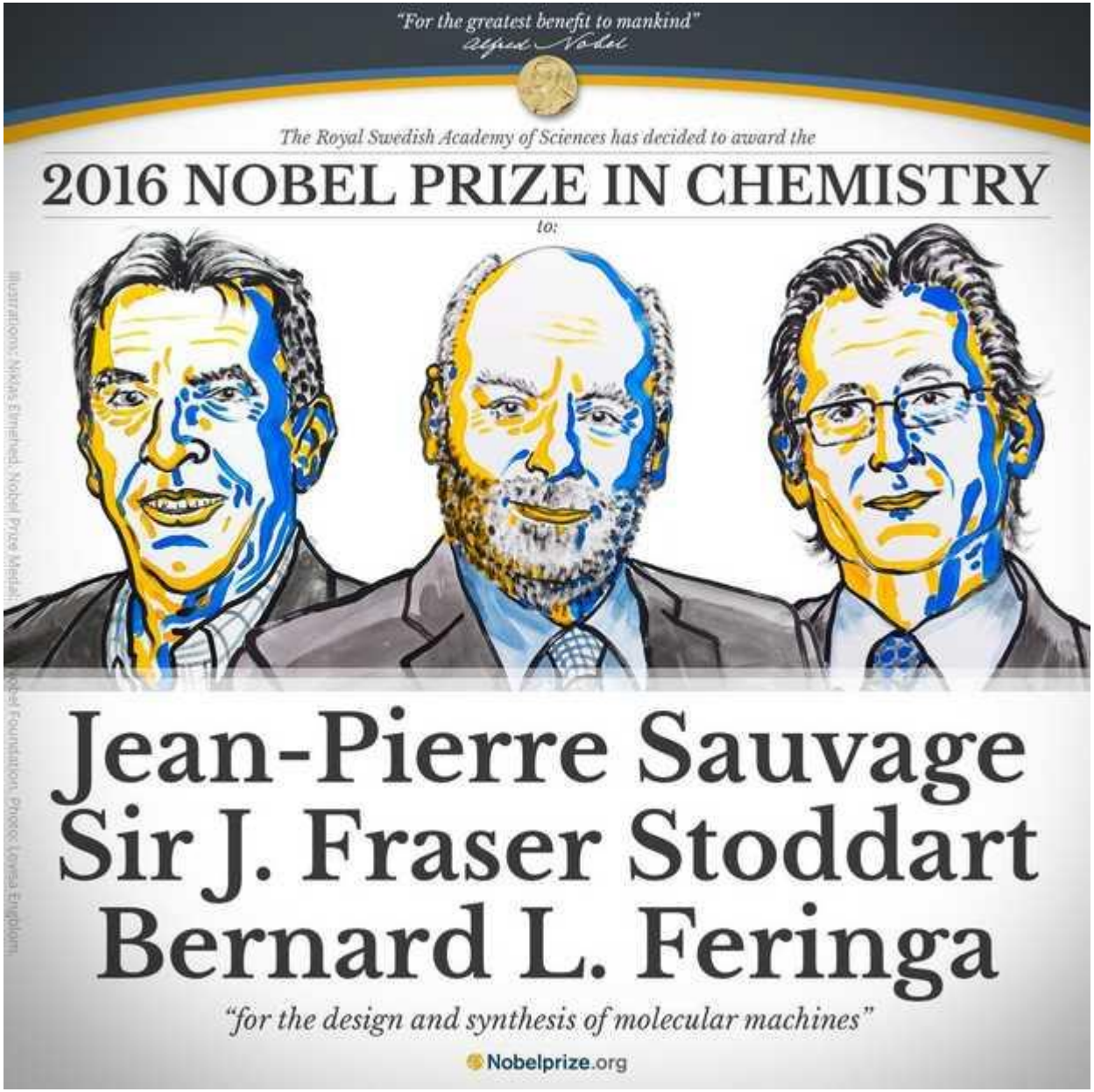
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Alfred Nobel
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Sir J. Fraser Stoddart
Bernard L. Feringa
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