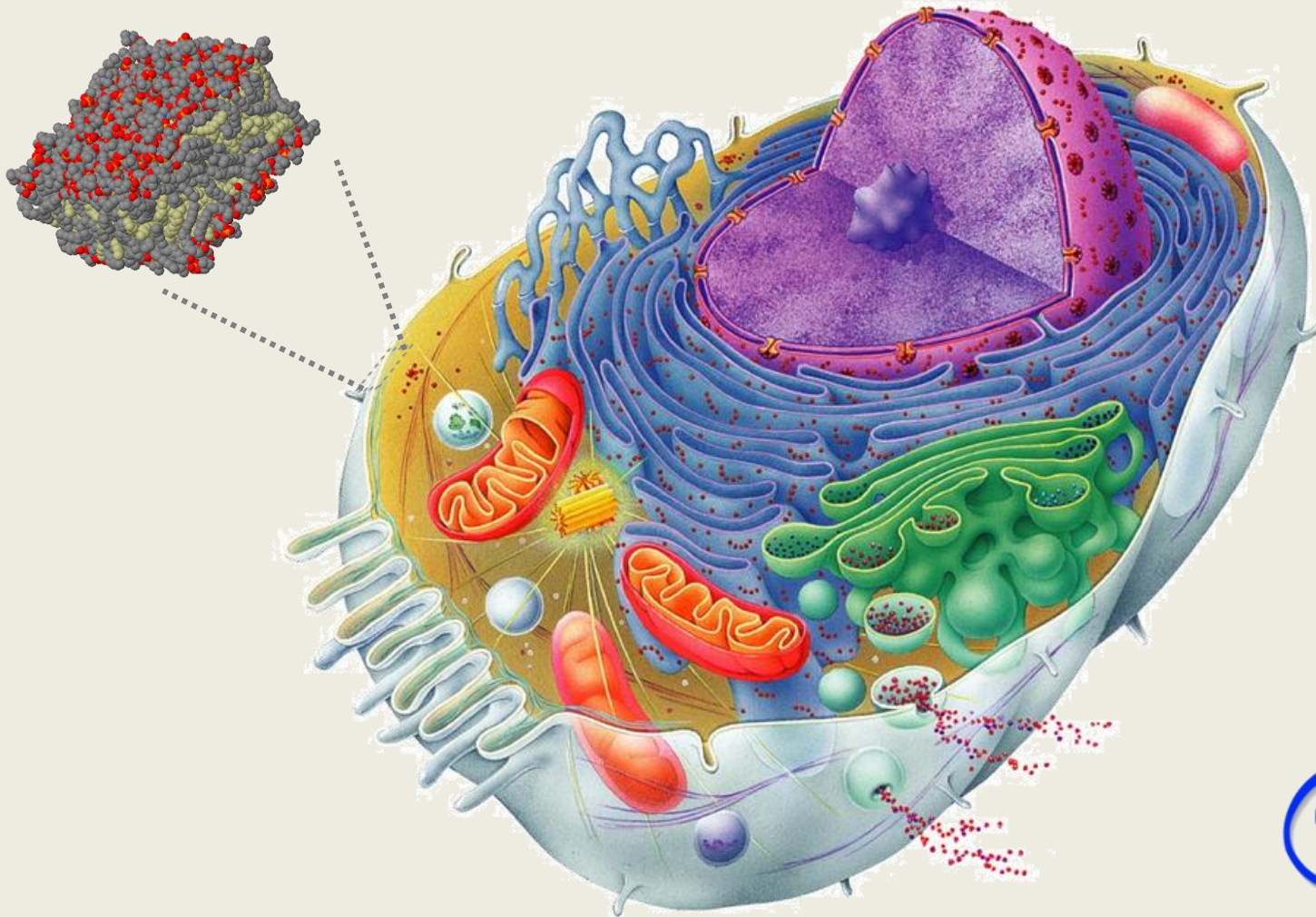


K. Velonia  
Laboratory of Supramolecular Chemistry & Synthetic Biomaterials  
Department of Materials Science and Technology, University of Crete

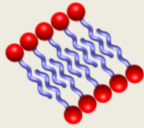
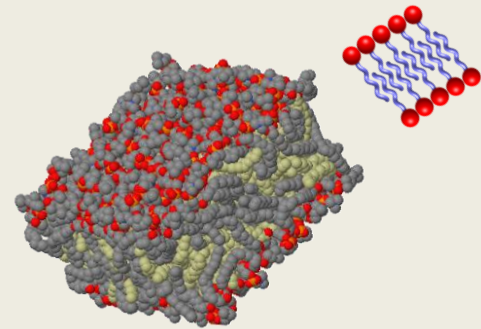
# Inspiration : Nature



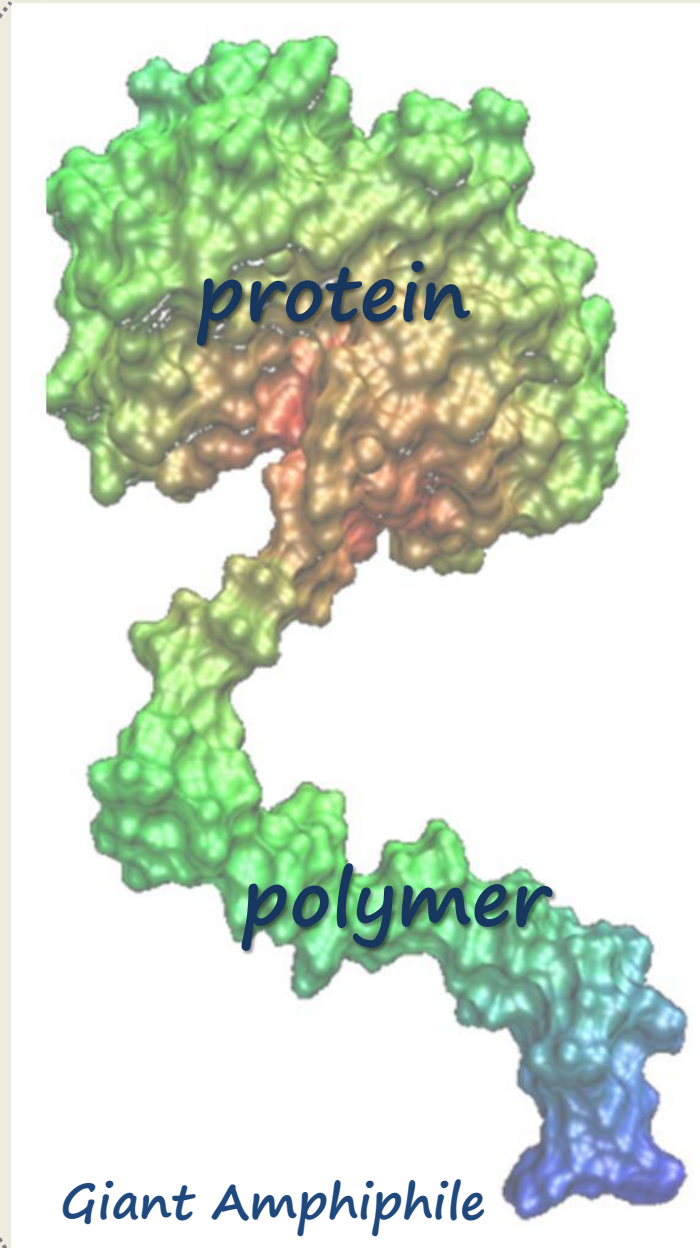
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*Assembly / Compartmentalization*

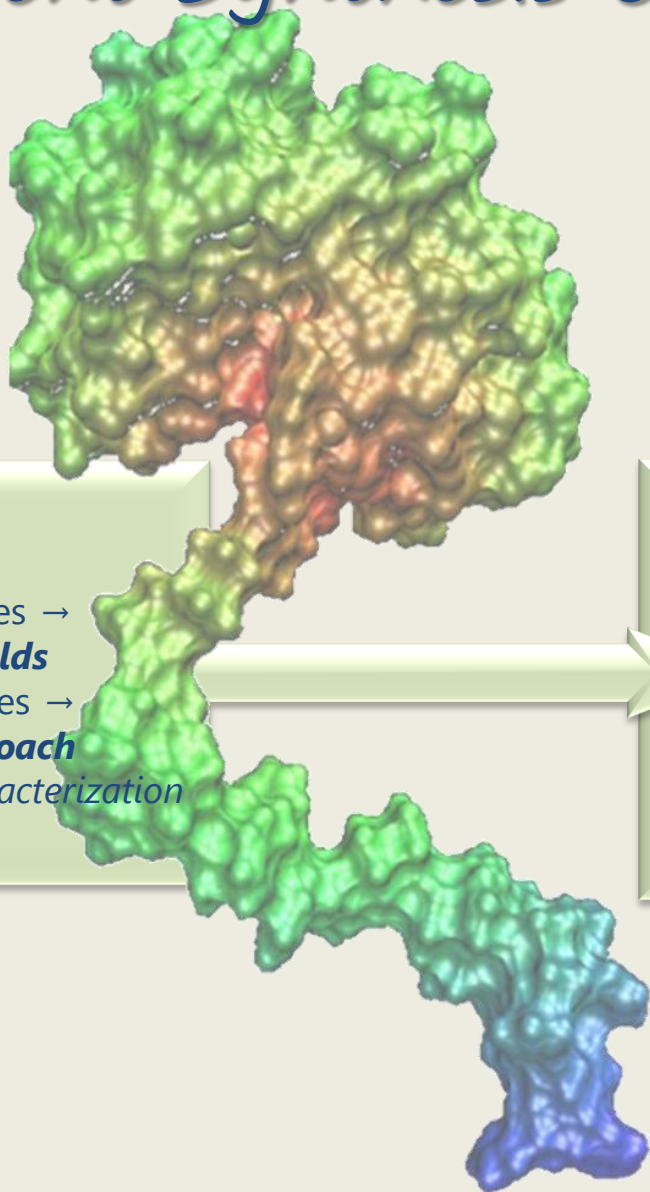
# Giant Amphiphiles



Molecular Amphiphile



# Goal Efficient Synthesis & Applications



## **Problems:**

- ✓ Amphiphilic macromolecules →  
**Low reaction yields**
- ✓ Multifunctional biomolecules →  
**No generic approach**
- ✓ Difficult purification & characterization

## **Efficient Synthesis:**

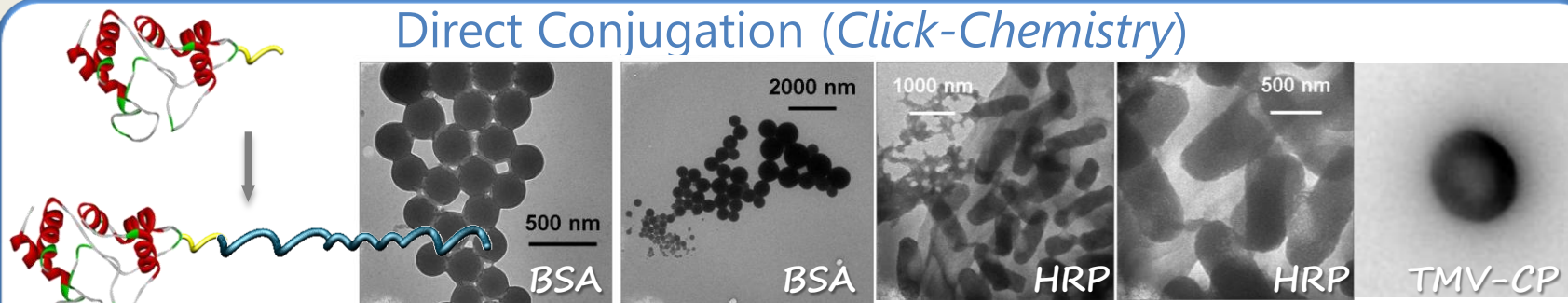
- ✓ Benign reaction conditions
- ✓ Absence of by-products
- ✓ Quantitative reactions
- ✓ Easy purification

## **Applications :**

nanocontainers, nanoreactors in aqueous and organic media, multifunctional assemblies.

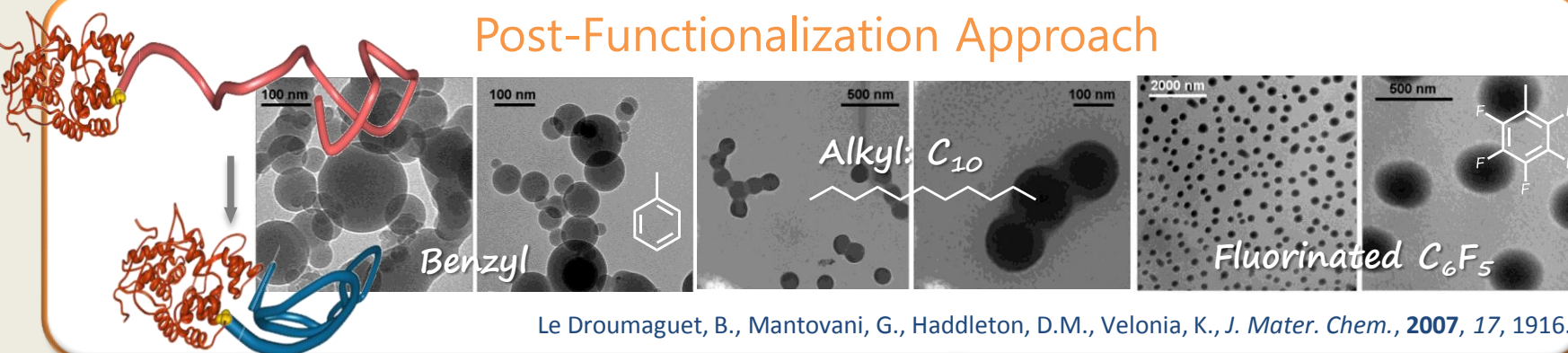
# Synthetic Approaches.

## Direct Conjugation (Click-Chemistry)



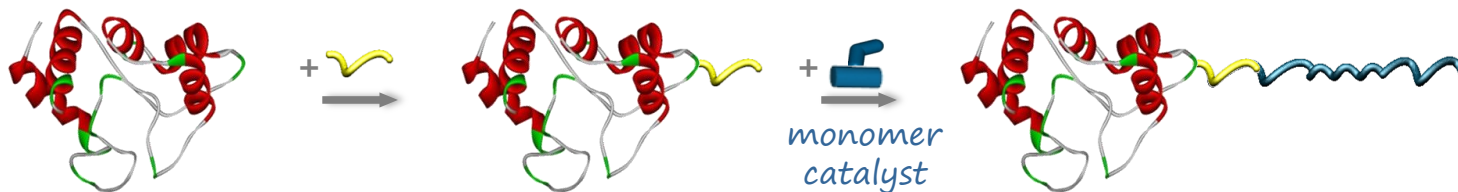
Velonia K., Rowan A.E., Nolte R. J.M. *J. Am. Chem. Soc.* **2002**, 124, 4224. Hatzakis, N. S., et al., *Chem. Commun.*, **2006**, 19, 1212.

## Post-Functionalization Approach



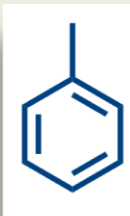
Le Droumaguet, B., Mantovani, G., Haddleton, D.M., Velonia, K., *J. Mater. Chem.*, **2007**, 17, 1916.

## Grafting *from* approach / one-pot synthesis

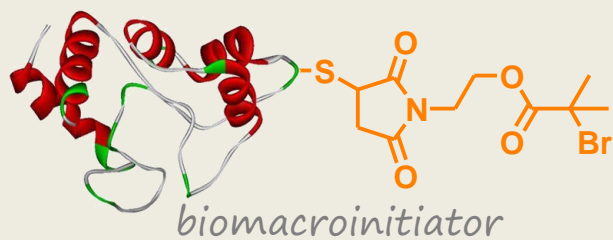


B. Le Droumaguet, K. Velonia, *Ang. Chem. Int. Ed.* **2008**, 120, 6359.  
E. Daskalaki, B. Le Droumaguet, D. Kritsiotakis, A. Askounis, *Pol. Chem.*, 2011, accepted  
E. Daskalaki, V. Liamas, H. Al Tabchi, V. Darcos, K. Velonia, 2011, submitted for publication

# One-pot synthesis - ATRP

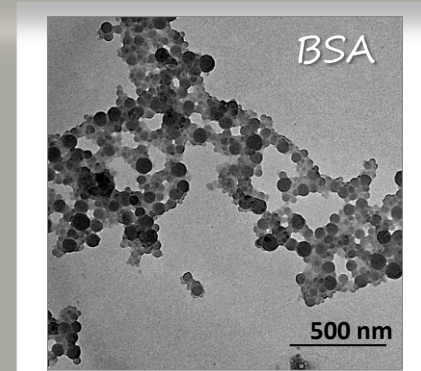
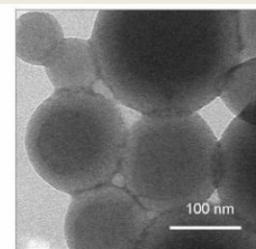
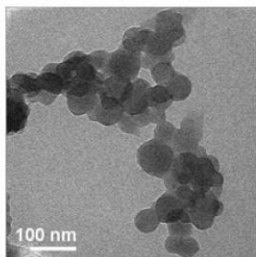
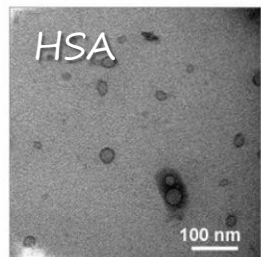
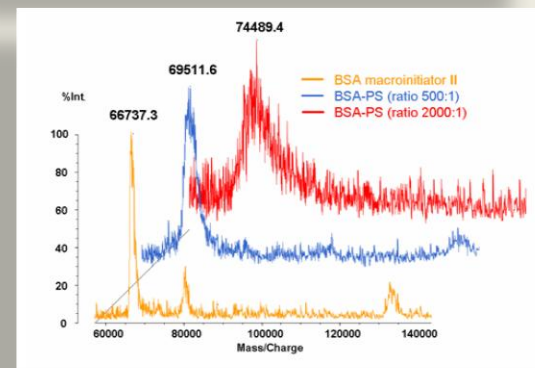
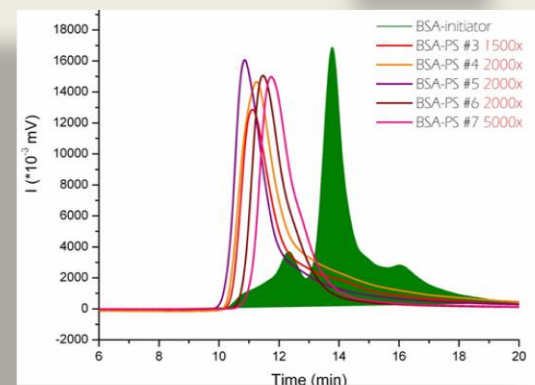
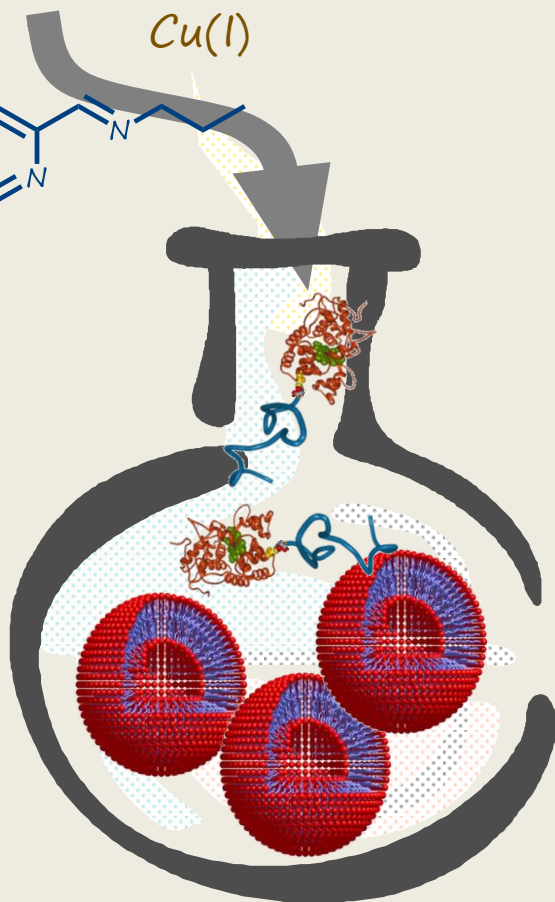
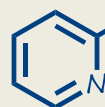


monomer

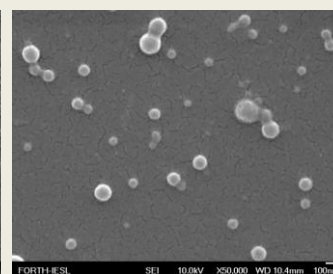
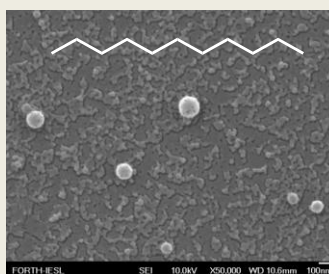
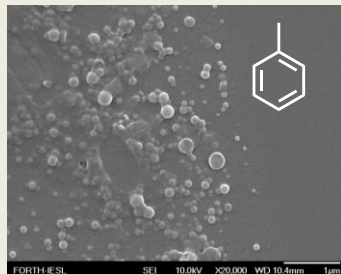
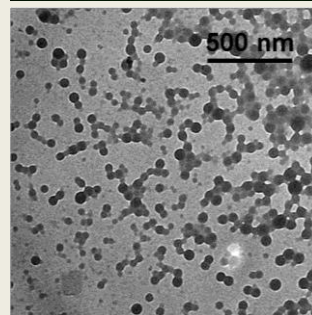
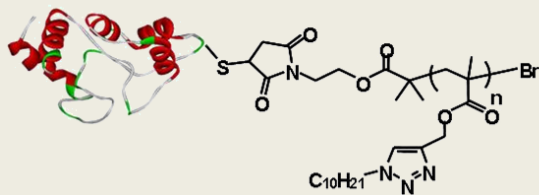
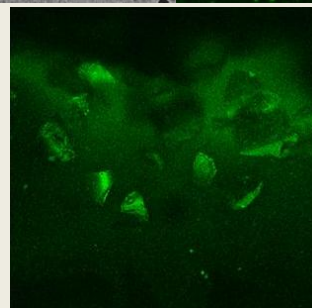
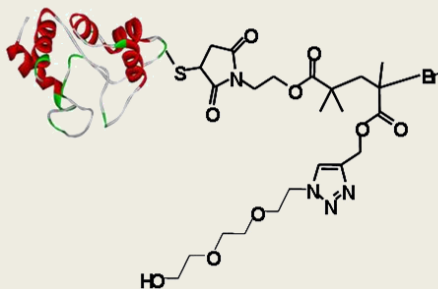
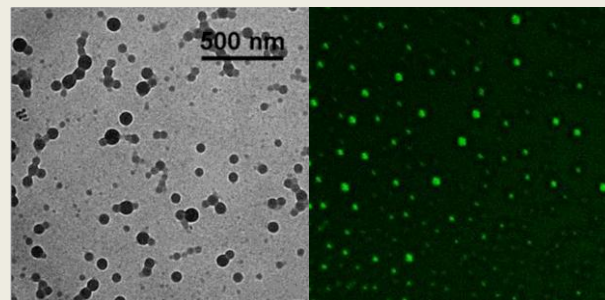
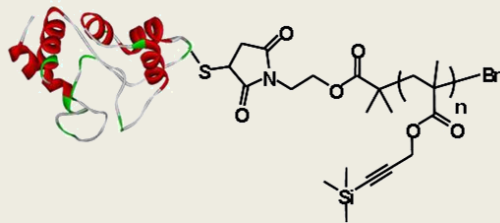


biomacromolecule

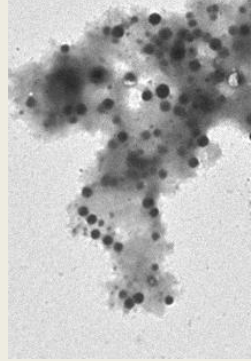
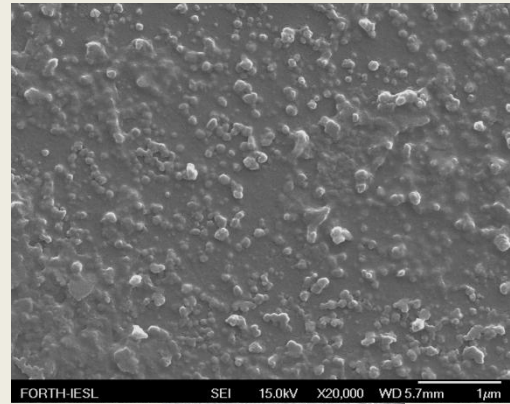
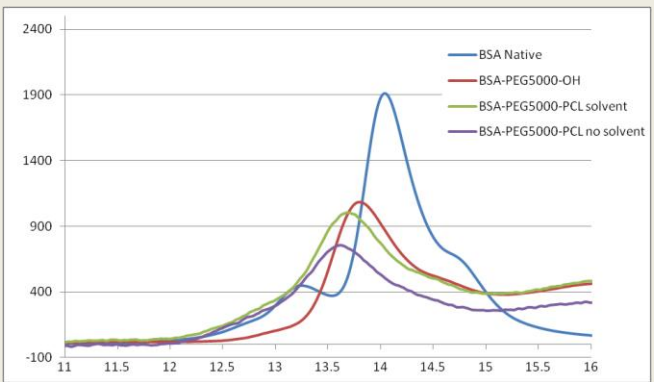
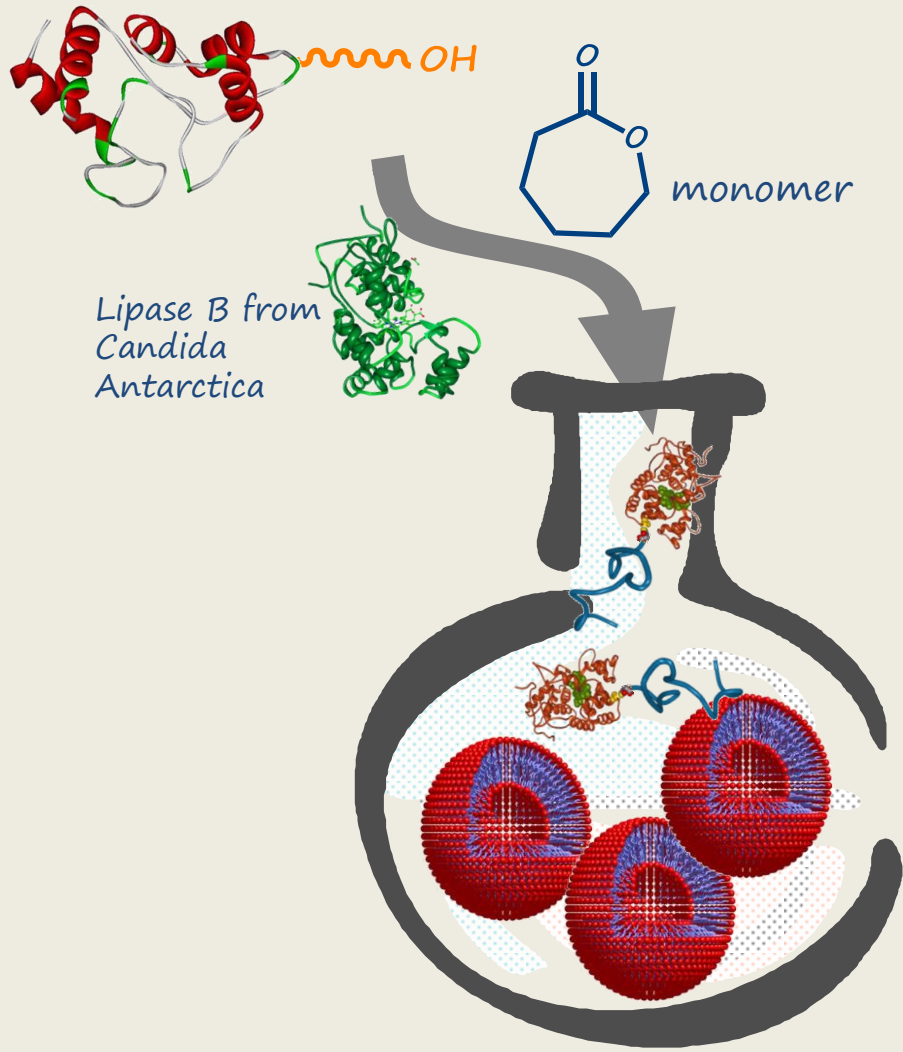
monomer  
Cu(I)



# One-pot synthesis - ATRP



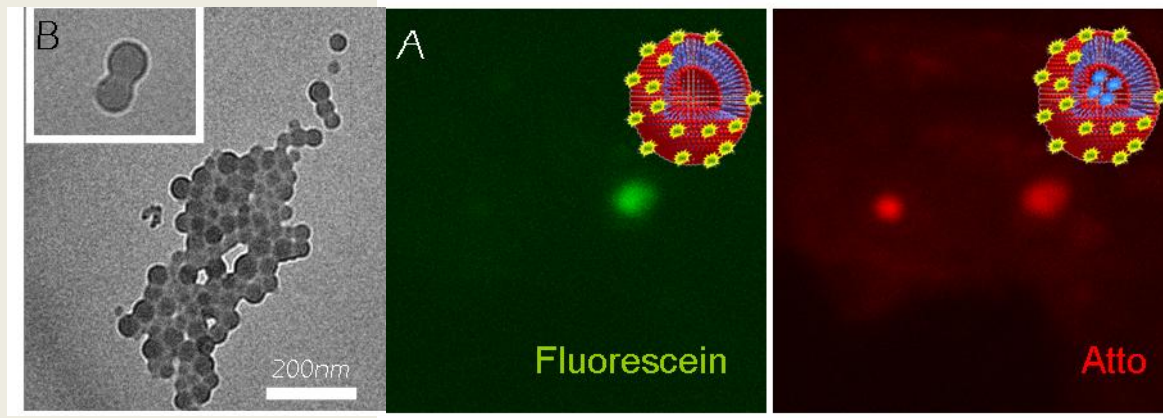
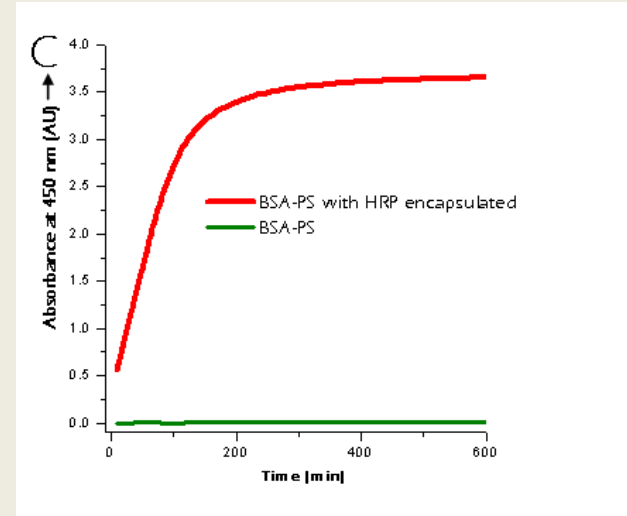
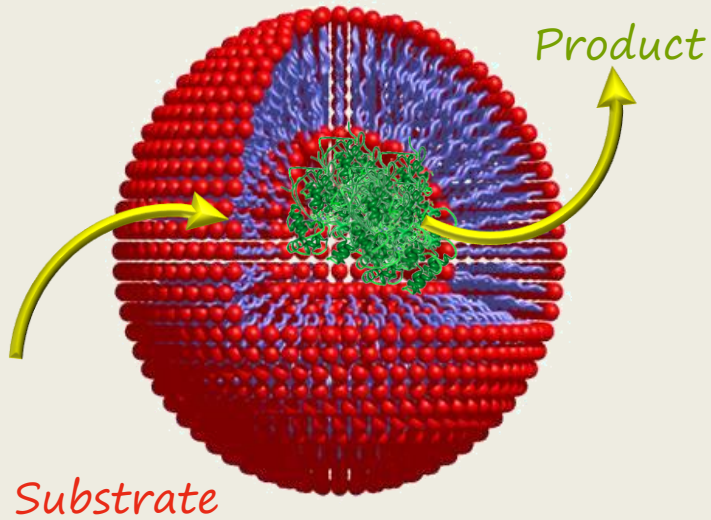
# Going "green": Biocompatible/Biodegradable G.A.



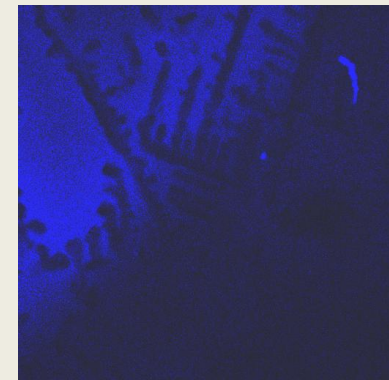
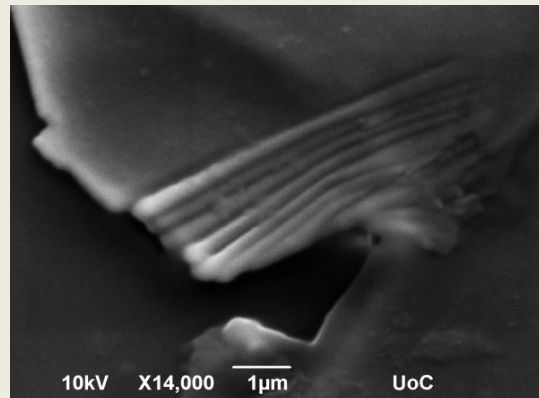
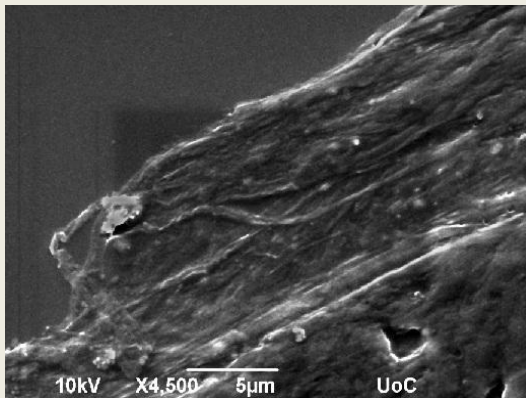
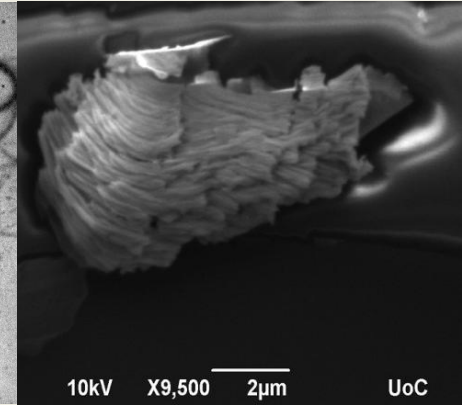
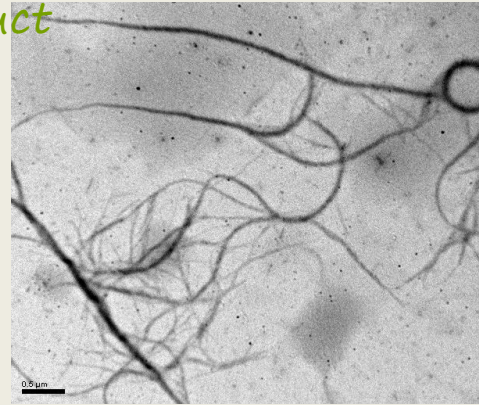
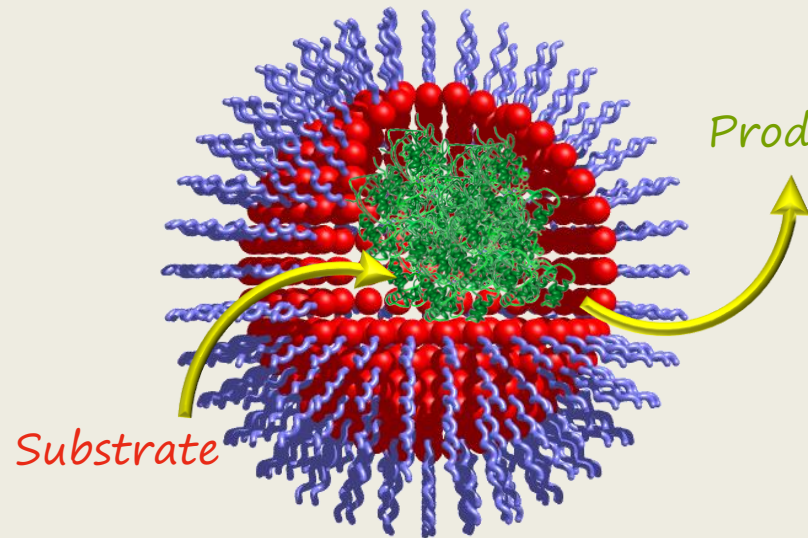


*... what about applications ???*

# Nanoreactors in water

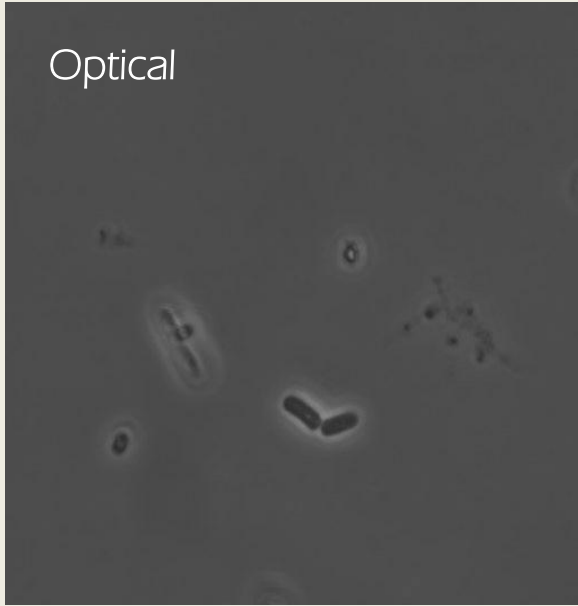


# Nanoreactors in Toluene

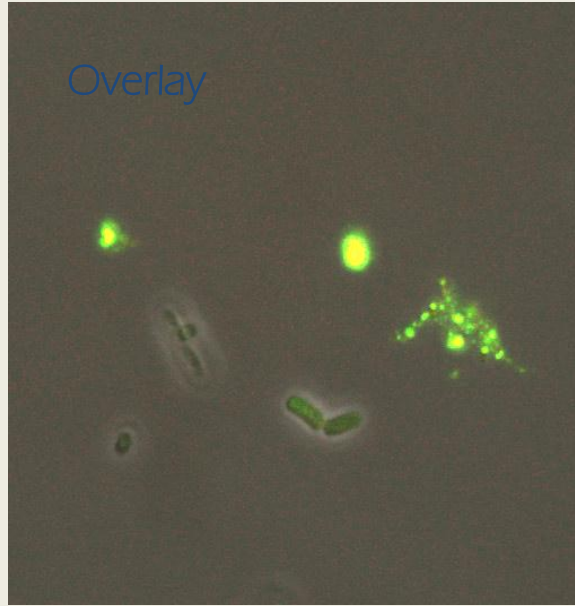


# Interaction with bacteria – E.coli

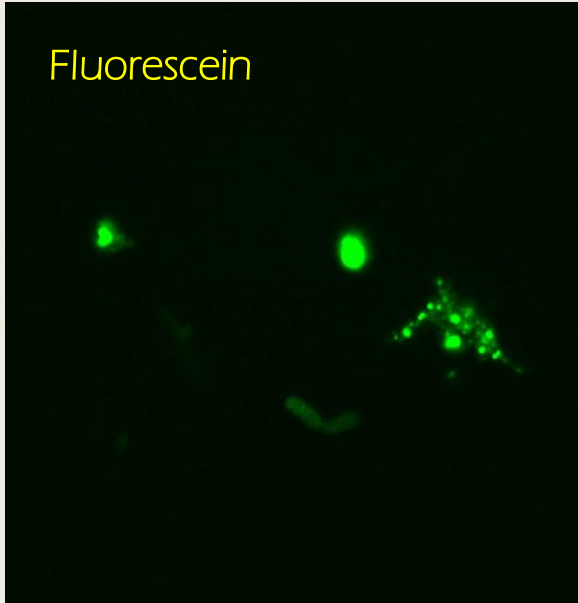
Optical



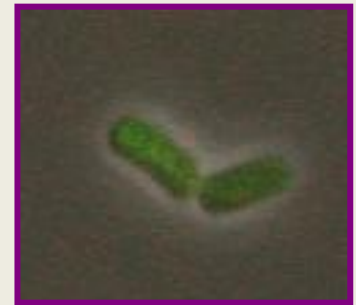
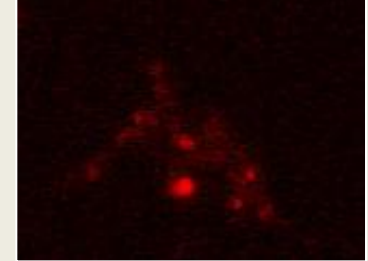
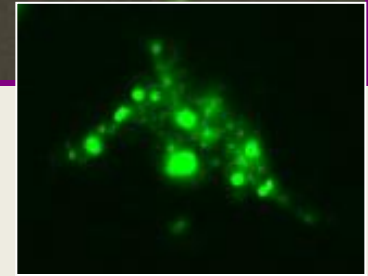
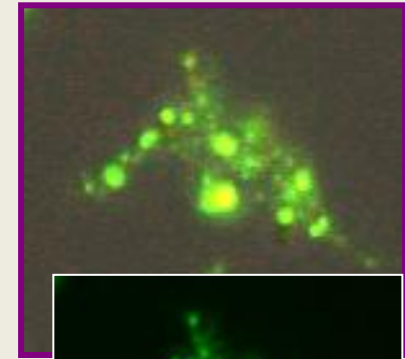
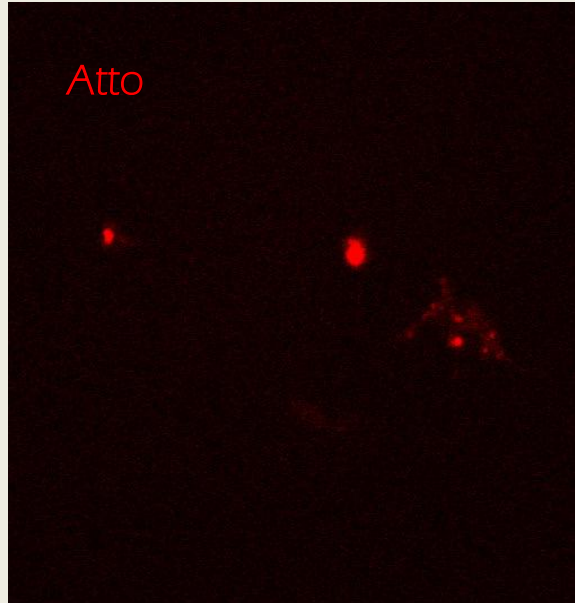
Overlay



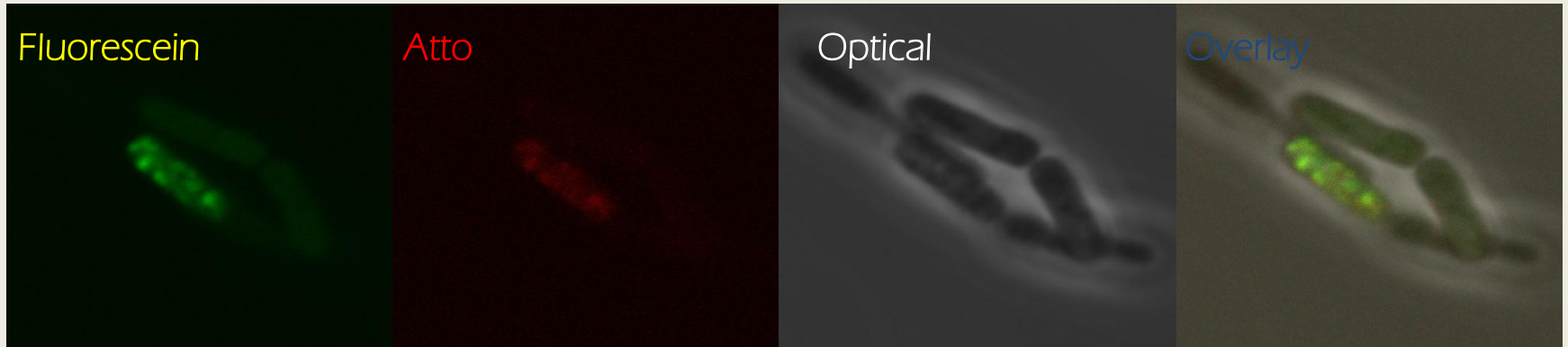
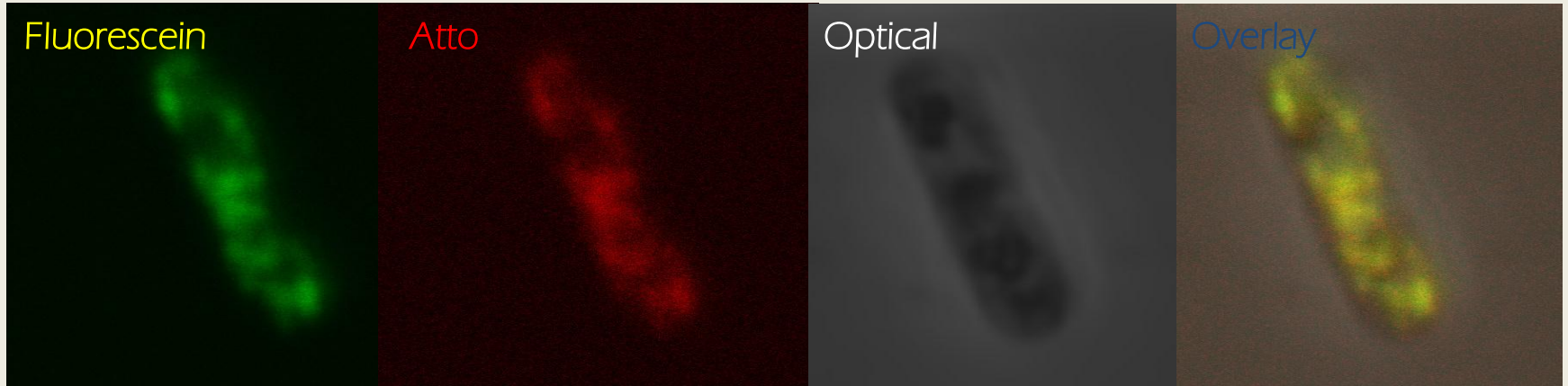
Fluorescein



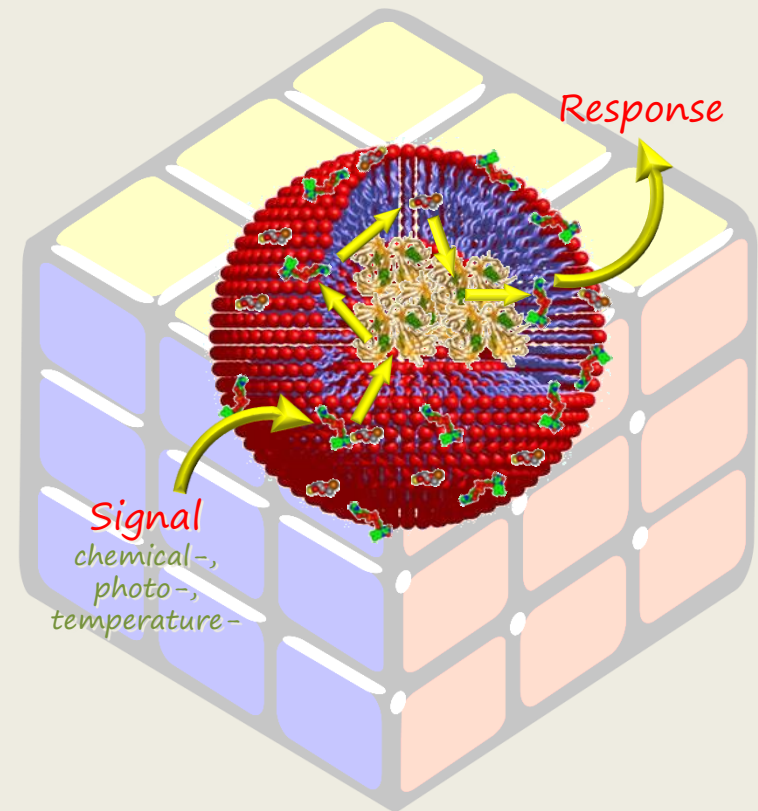
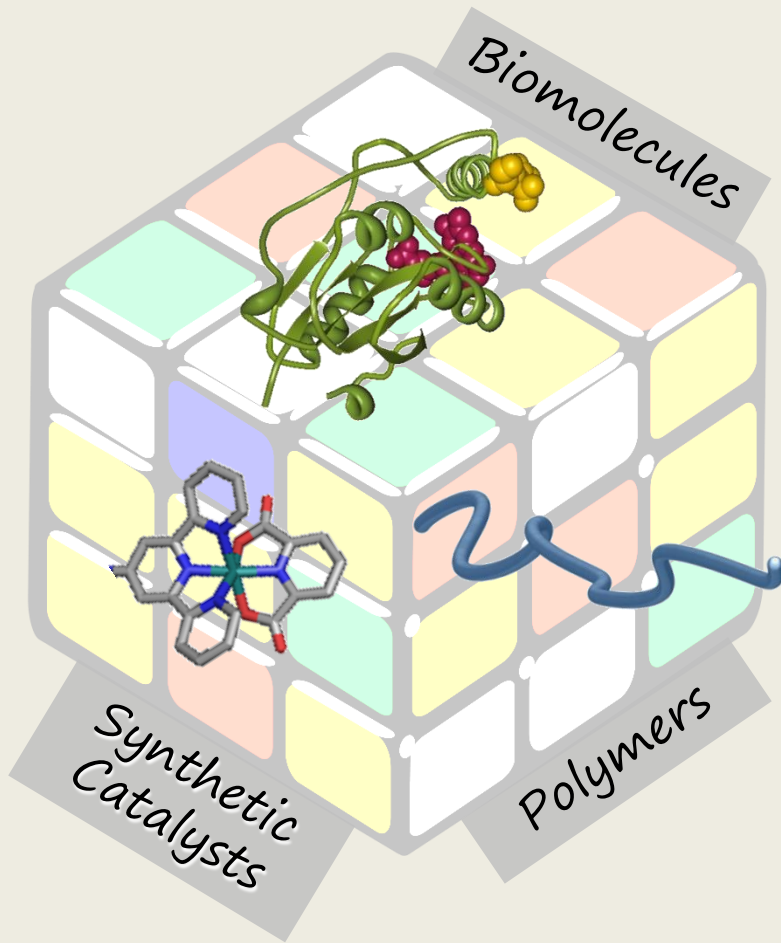
Atto



# Interaction with bacteria – E.coli



# A Holy Grail ...



Cell Mimicking BioMaterials

Superstructures aimed to Perform Specific Functions with a Controlled Manner and precision down to the Single Molecule.

# Acknowledgments

E. Daskalaki, K. Hatzimanolis, E. Liamas, H. Al Tabchi, Th. Zisis  
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(sub)

EAKE UOC Funding

# Interaction with bacteria – E.coli

