

SCUOLA  
NORMALE  
SUPERIORE



# Nanosciences

## 1° Year Ph.D Report

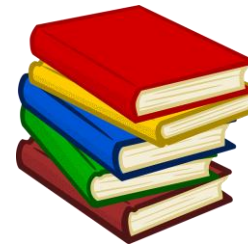
Ph.D Student *Giulia Giannone*  
Supervisor *Valerio Voliani*

National Enterprise for nano**S**cience and nano**T**echnology

NEST



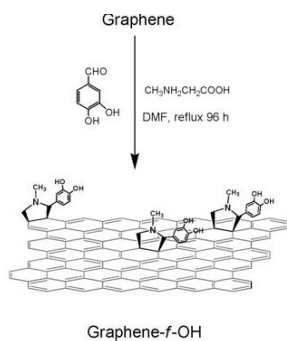
# Study plan



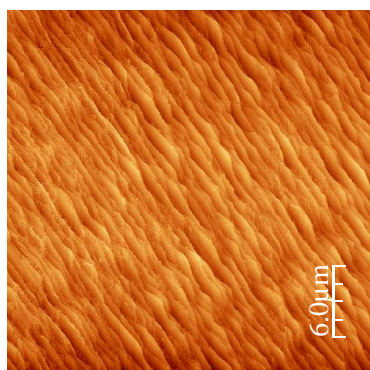
Courses	Hours
Fundamentals of Biophysics at the nanoscale <i>(S. Luin, F. Cardarelli, R. Nifosì)</i>	50
Biosensors I <i>(R. Bizzarri)</i>	24
Biosensors II <i>(R. Bizzarri)</i>	20
Electron microscopy of Nanomaterials <i>(M. Gemmi)</i>	48

## STM Lab

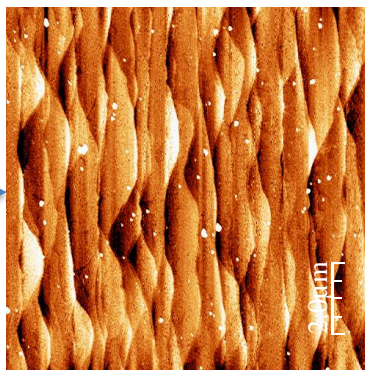
### ➤ Idea



### ➤ AFM results



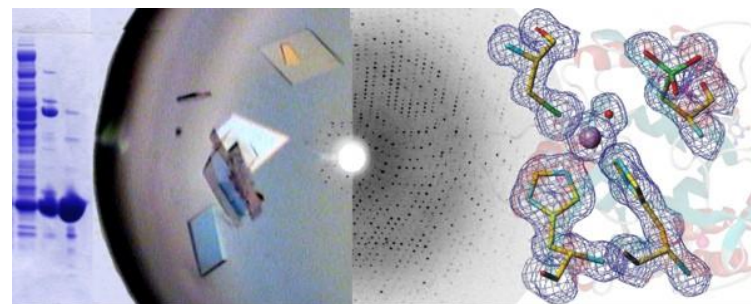
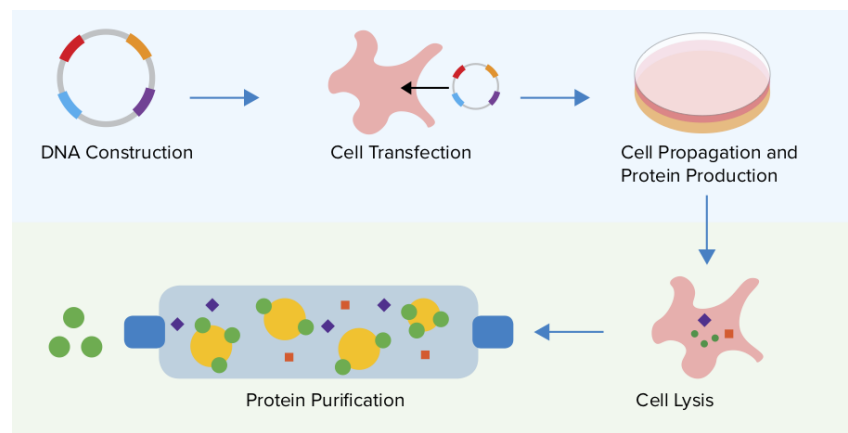
Pre-Functionalization



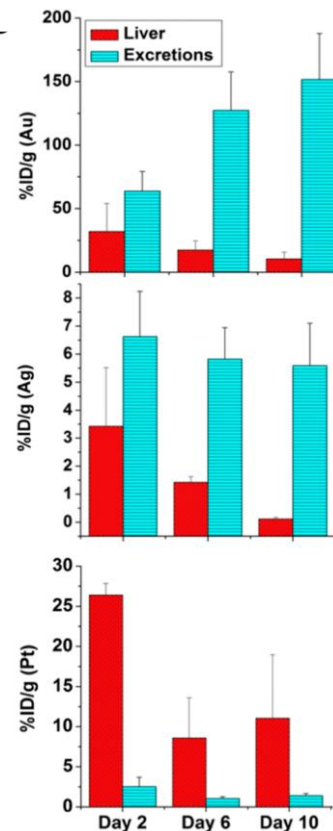
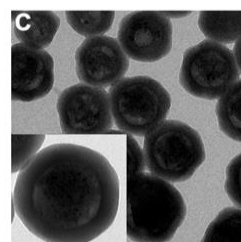
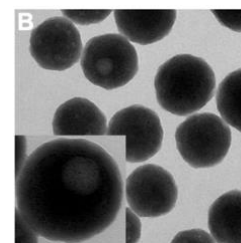
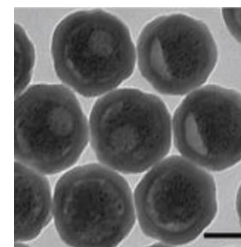
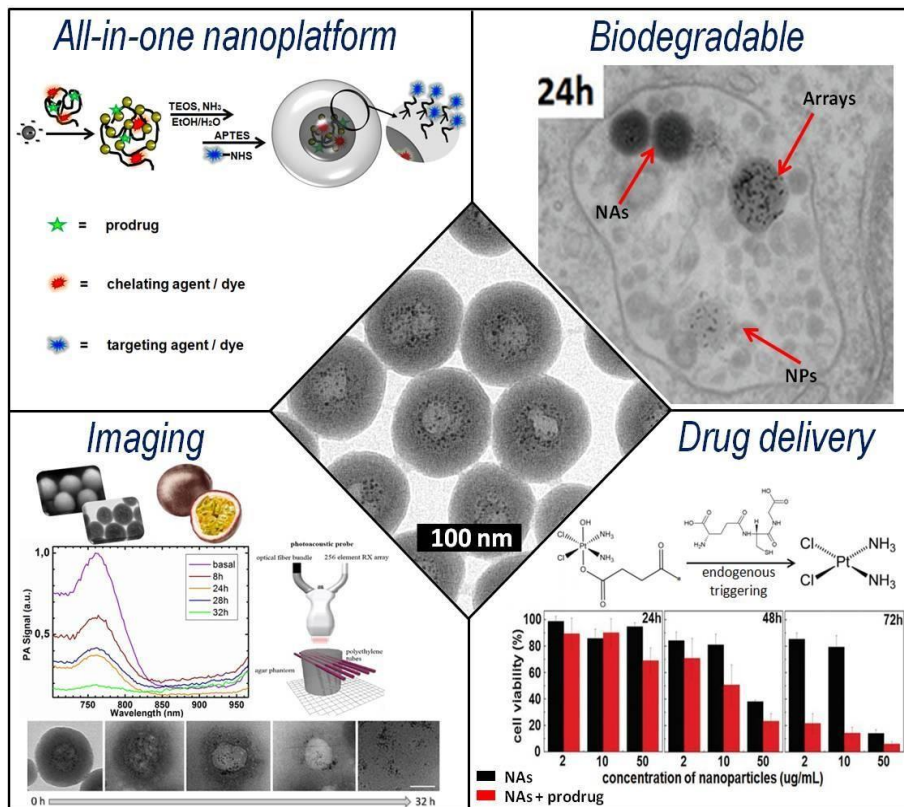
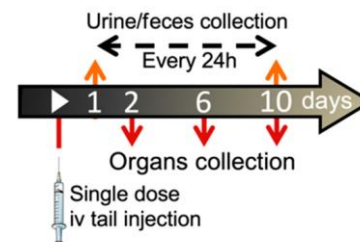
Post-Functionalization

## NanoBiostructures Lab

### ➤ Cloning, expression and purification of protein



# Research project: Past



FULL PAPER  
Nanothernostics

Particle  
Particle Systems Characterization  
www.particle-journal.com

ACS APPLIED  
BIO MATERIALS

Article

www.acsabm.org

Biodegradable Ultrasmall-in-Nano Gold Architectures:  
Mid-Period In Vivo Distribution and Excretion Assessment

Domenico Cassano, Maria Summa, Salvador Pociuvi-Martinez, Ana-Katrina Mapanao,  
Tiziano Catelani, Rosalia Bertorelli, and Valerio Voliani\*

Biosafety and Biokinetics of Noble Metals: The Impact of Their  
Chemical Nature

Domenico Cassano,<sup>1,3</sup> Ana-Katrina Mapanao,<sup>1,4,11</sup> Maria Summa,<sup>8,11</sup> Ylea Vlamidis,<sup>1</sup> Giulia Giannone,<sup>1,2</sup>  
Melissa Santi,<sup>1</sup> Elena Guzzolino,<sup>1</sup> Letizia Pitto,<sup>1</sup> Laura Polisenio,<sup>4,11</sup> Rosalia Bertorelli,<sup>5</sup>  
and Valerio Voliani<sup>6,7</sup>\*

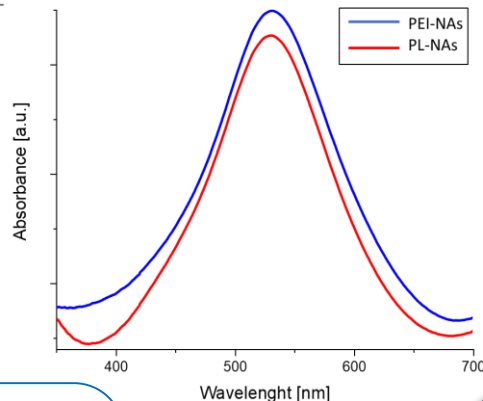
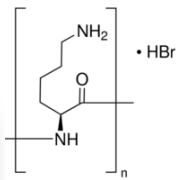
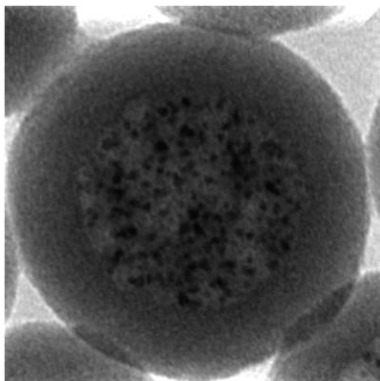
National Enterprise for nanoScience and nanoTechnology

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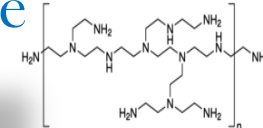
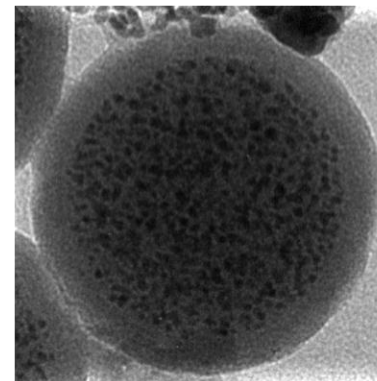


# Research project: Present

## Poly-L-Lysine

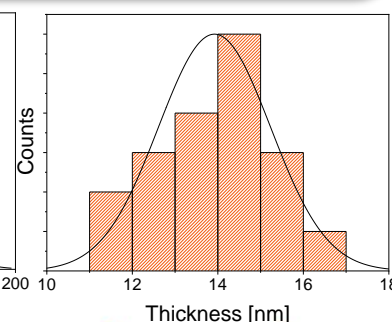
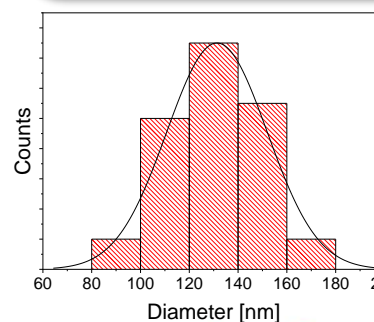
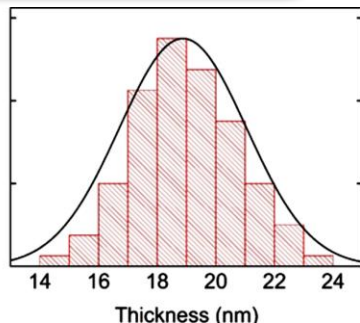
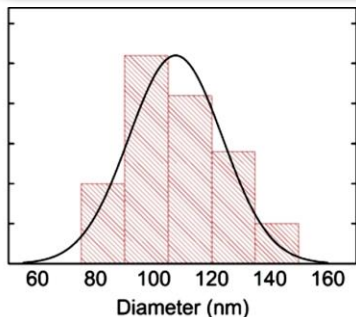


## Polyethylenimine



- Biodegradable in less than 24h
- Metal loading of about 5% w/w
- Cost of about 1€/mg

- Biodegradable in less than 24h
- Metal loading of about 9% w/w
- Cost of about 0,002€/mg



# Research project: Future

## Microfluidics for the production of nanoparticles

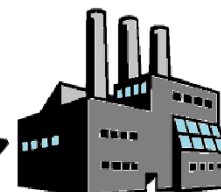
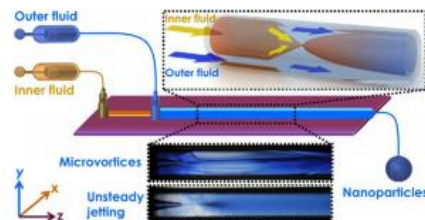
October 2019-December 2019

University of Helsinki-Prof Santos  
Lab.

- Scaling up Passion fruit NAs production

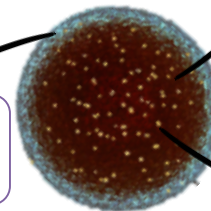
## Nanoarchitectures optimization

- New materials for NAs
- Functionalization and studies on new combined therapies
- New biological and non biological applications

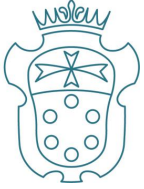


Polymeric  
Core  
chemistry

Shell thickness  
and  
functionalization



Metals chemistry  
and dimension



*Thank you for the  
attention*