

METALLOMIC
SCIENTIFIC NETWORK

Metallomic Scientific Network No. 11440027

Metallomics - What is it? - part II

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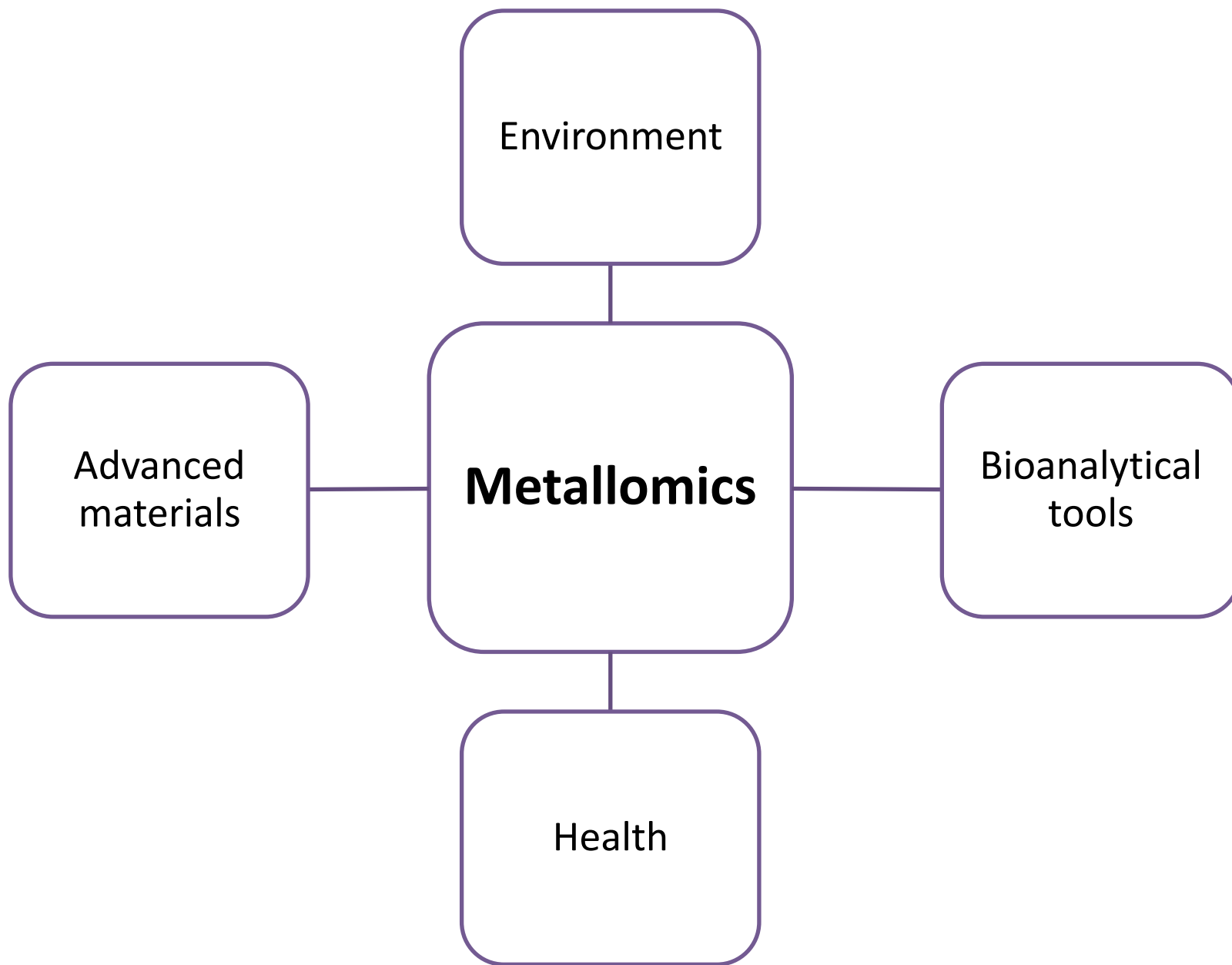
- Metallomics
- Advanced methods and materials in metallomics
 - Environment
 - Health
 - Bioanalytical tools
 - Advanced materials

Metallomics - definition

- *Comprehensive analysis of the entirety of metal and metalloid species within a cell or tissue type* (J. Szpunar)
- *Study of metal-containing biomolecules* (H. Haraguchi)
- *Integrated biometal science* (H. Haraguchi)
 - Great significance in study of physiological and pathophysiological processes
 - Heavy metals-based nano- and micromaterials and their fate in the organisms and environment

Metallome

- *by analogy with proteome*
 - Distribution of free metal ions in every one of cellular compartments (R.J.P. Williams)
- *alternative definition*
 - Metalloproteins or any other metal-containing biomolecules (H. Haraguchi)
- Considered as branch of metabolomics, even though the metals are not typically considered as metabolites
- Metallo -
 - transcriptome
 - proteome
 - metabolome
 - interactome



Paramagnetic particles

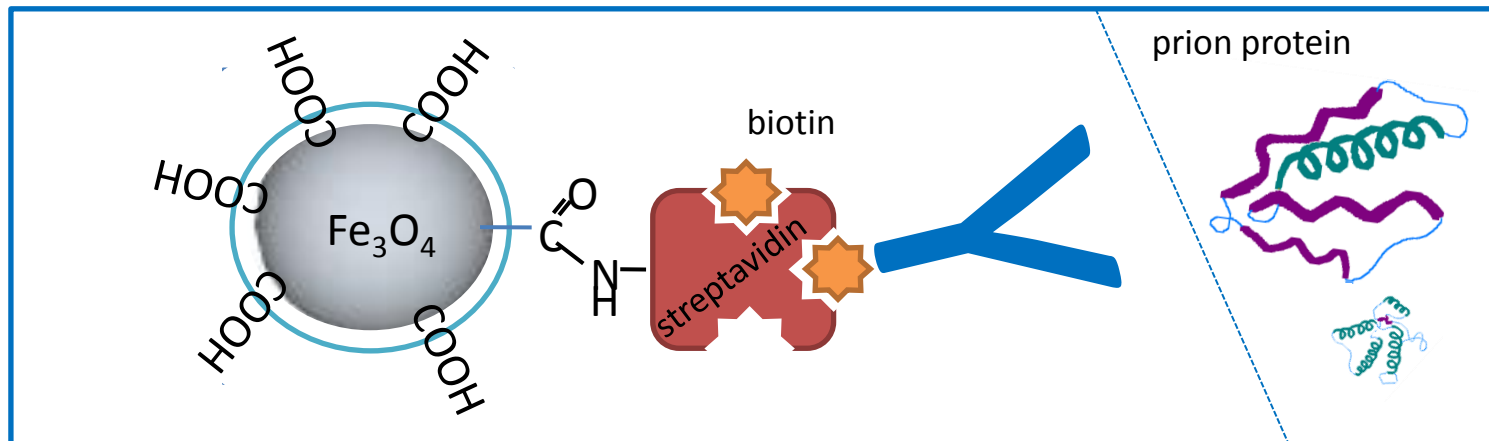
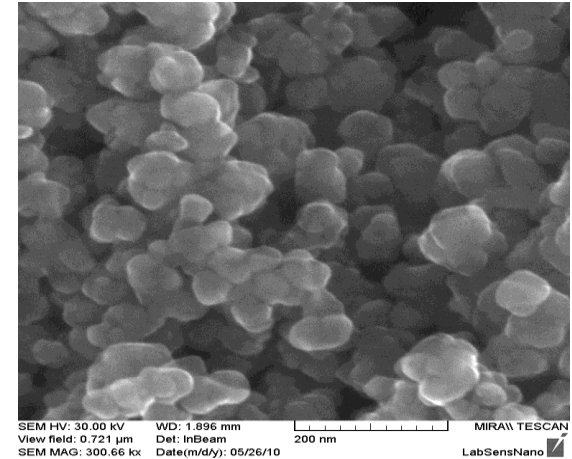
NANOIMUNOCHEMICAL SEPARATION

Paramagnetic nanoparticles

- size: ≤ 100 nm,
- larger reaction surface – higher separation efficiency,
- paramagnetic properties.

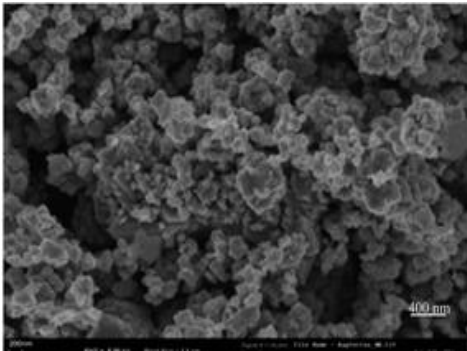
Advantages

- isolation of very low concentration of target analyte,
- heterogeneous systems,
- without previous processing (centrifugation, chromatography)

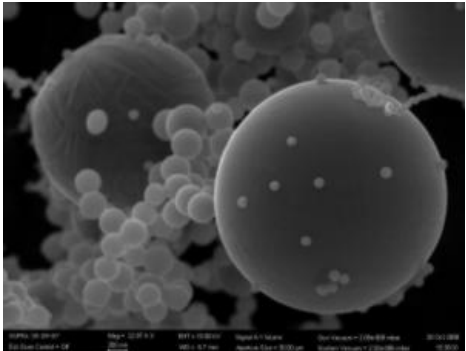


Advanced materials:

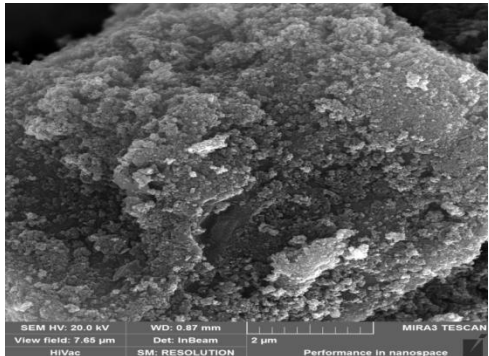
Paramagnetic particles



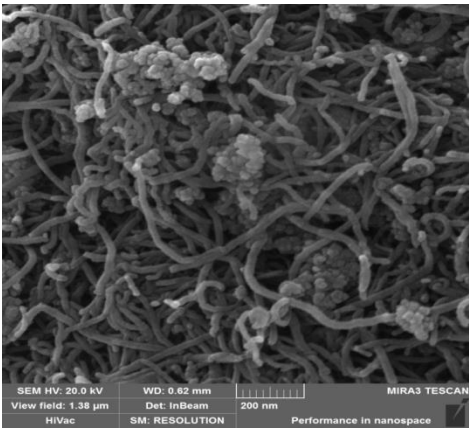
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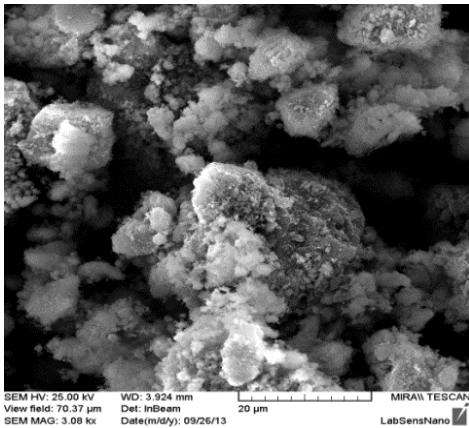
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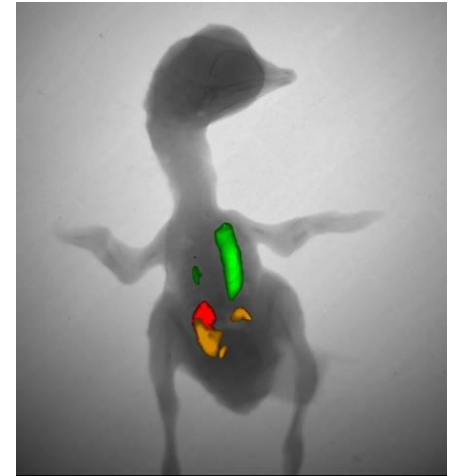


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Advanced materials:

Quantum dots

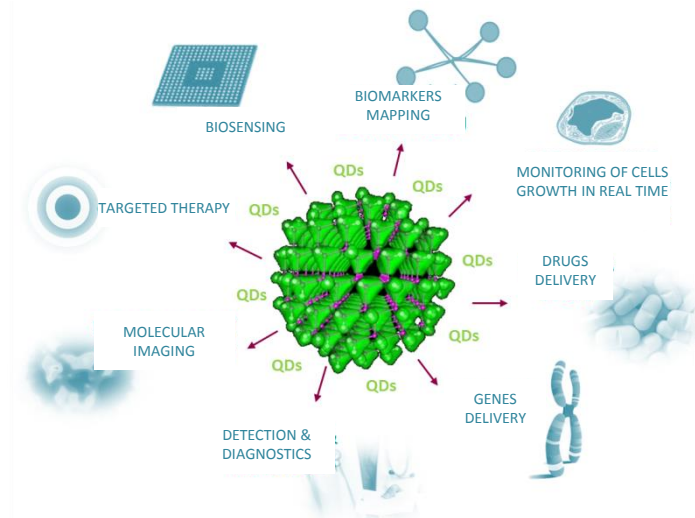
- *semiconductor nanocrystals,*
- *size from units to hundreds nm,*
- *tunable optical and electric properties,*
- *alternative to organic and fluorescent dyes.*



Quantum dots– Photo-physical properties

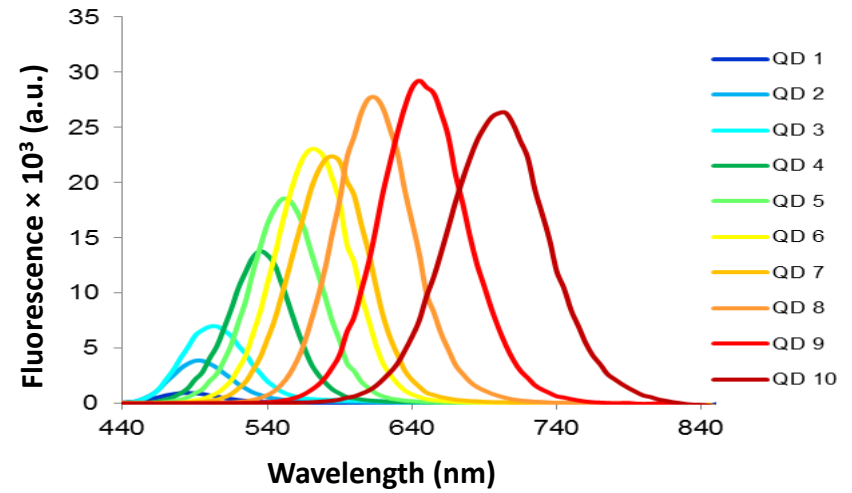
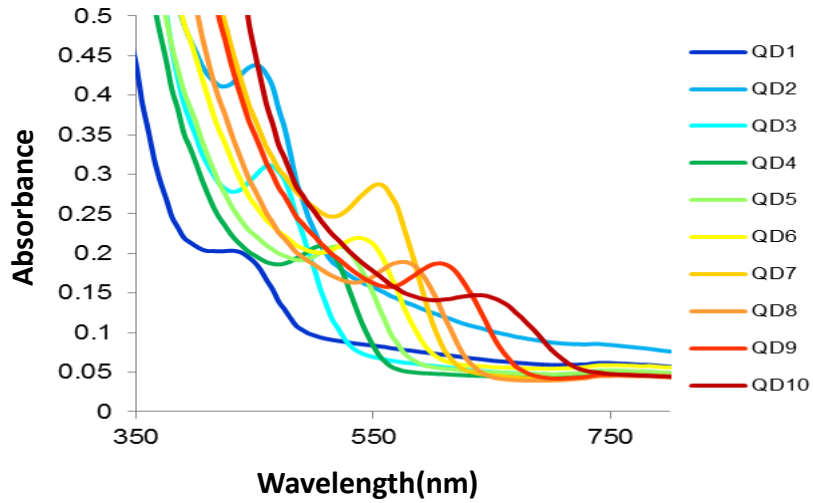
- *broad absorption spectrum,*
- *narrow emission spectrum,*
- *long fluorescence lifetime (~ 10 ns),*
- *high photostability,*
- *high extinction molar coefficient.*

Application



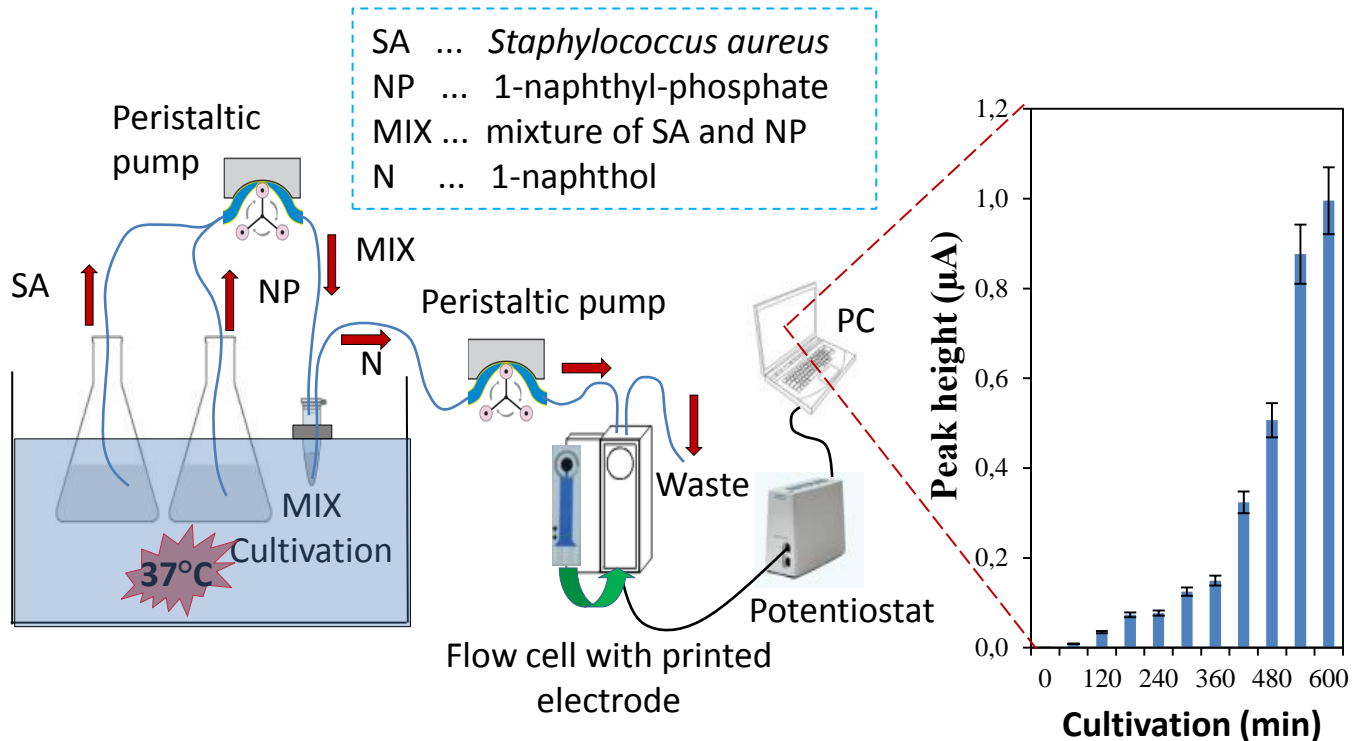
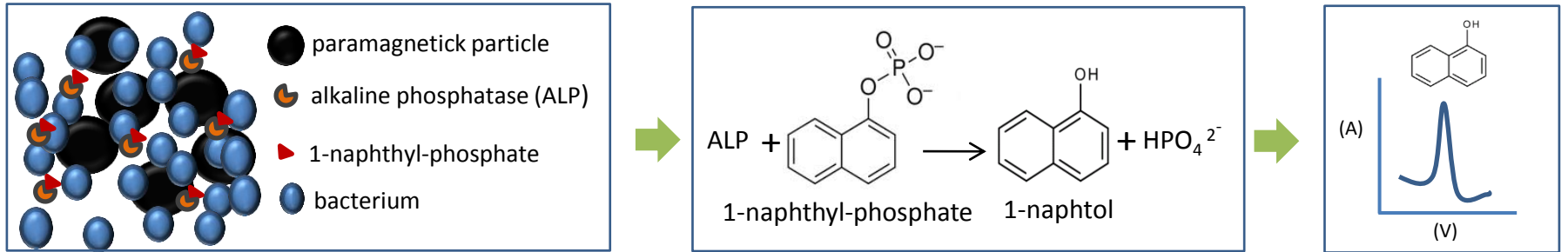
Advanced materials:

Quantum dots



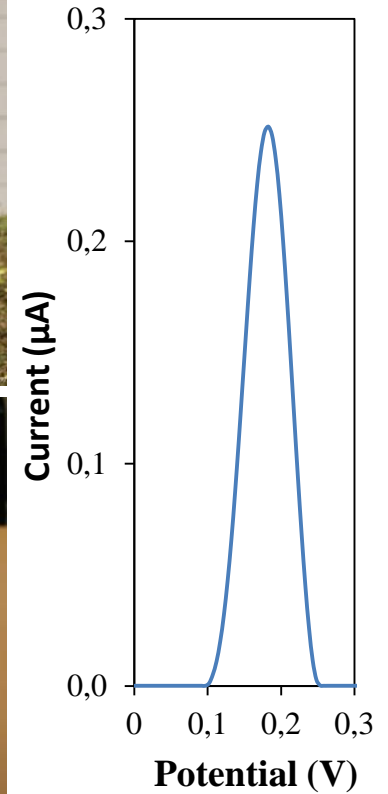
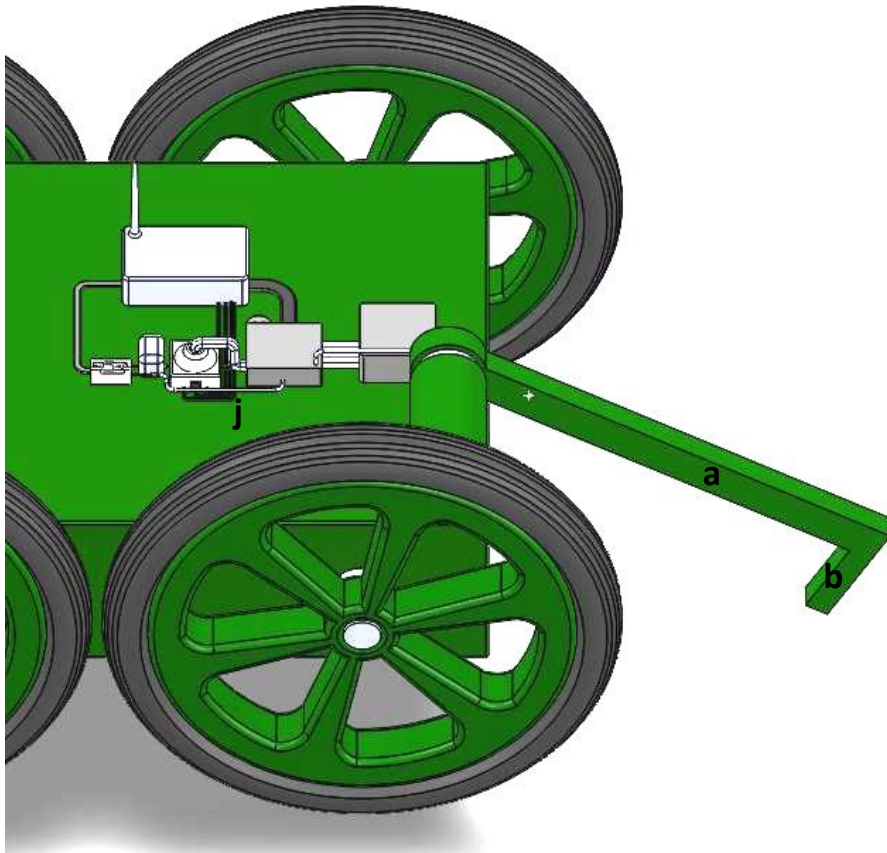
Environment:

Robotic isolation of bacteria using paramagnetic particles



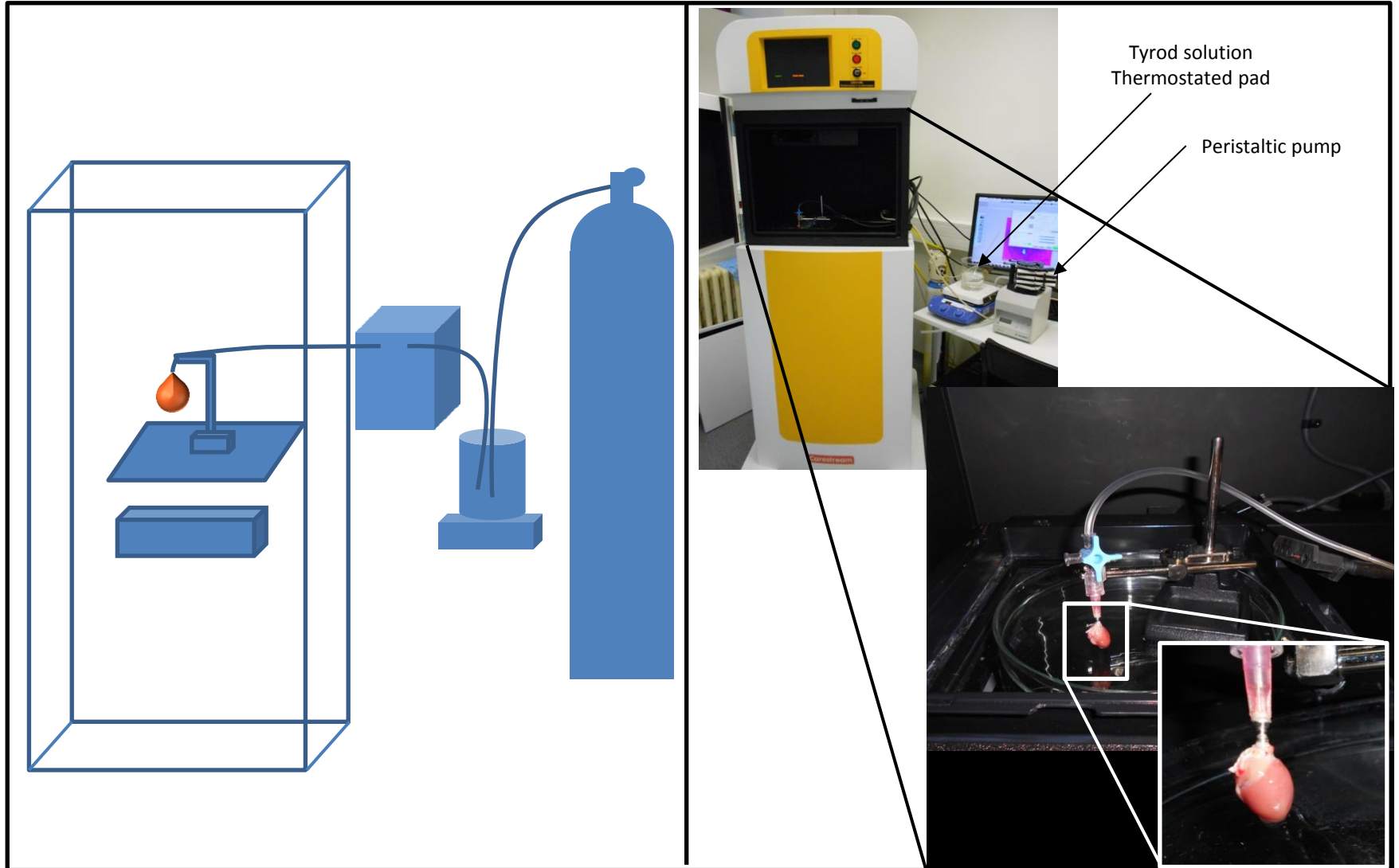
Environment:

Robotic isolation of bacteria using paramagnetic particles – Orfeus



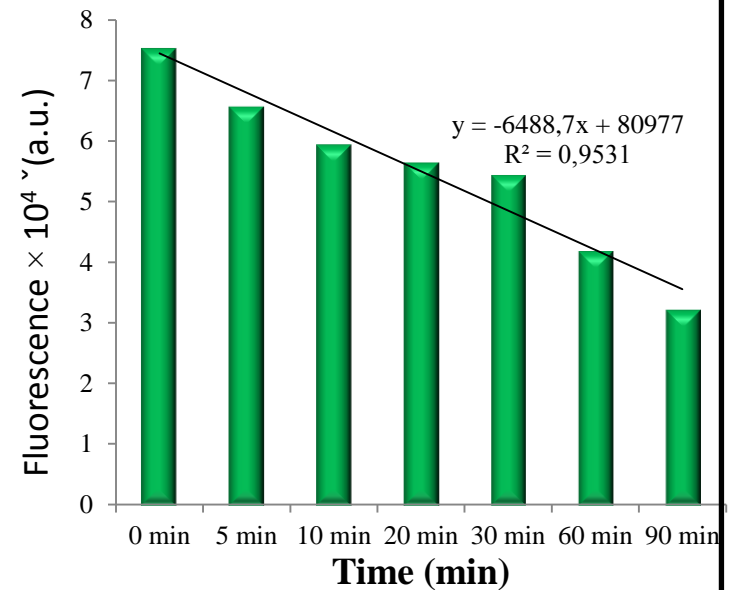
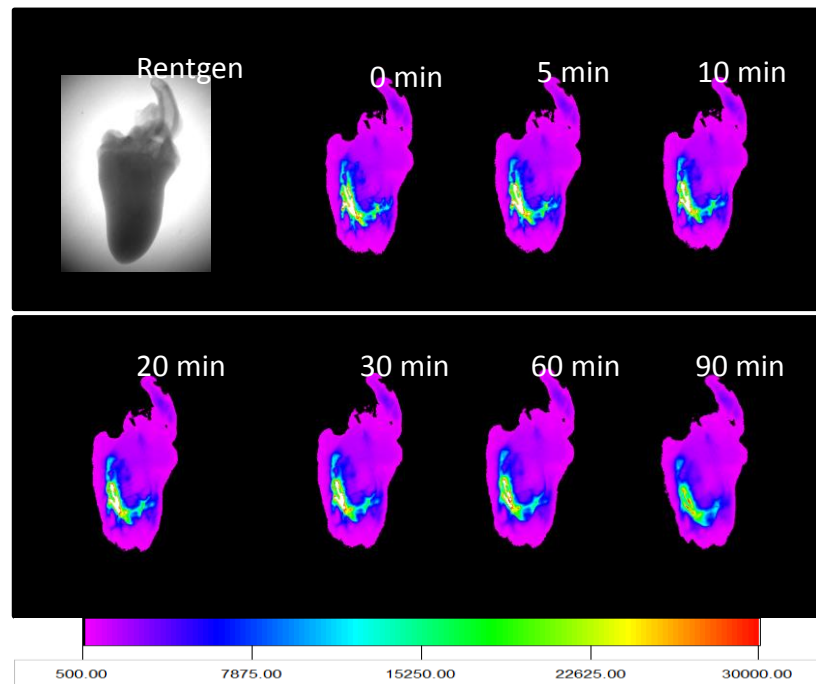
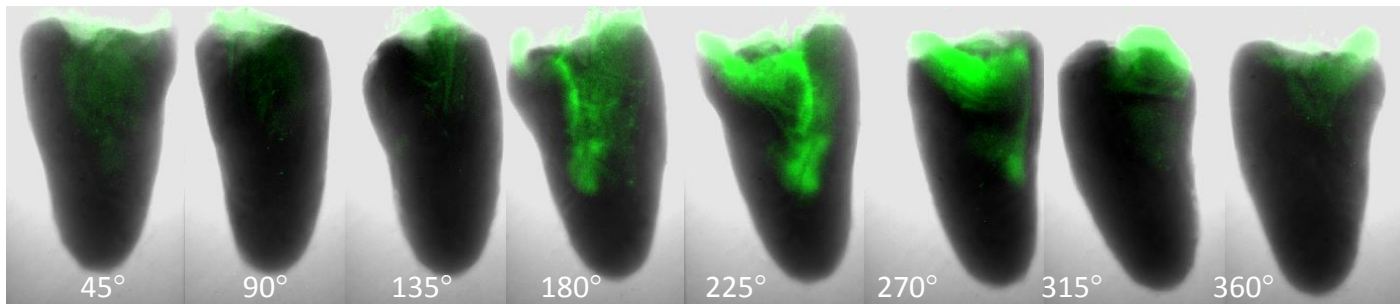
Health:

In vivo imaging technology with quantum dots



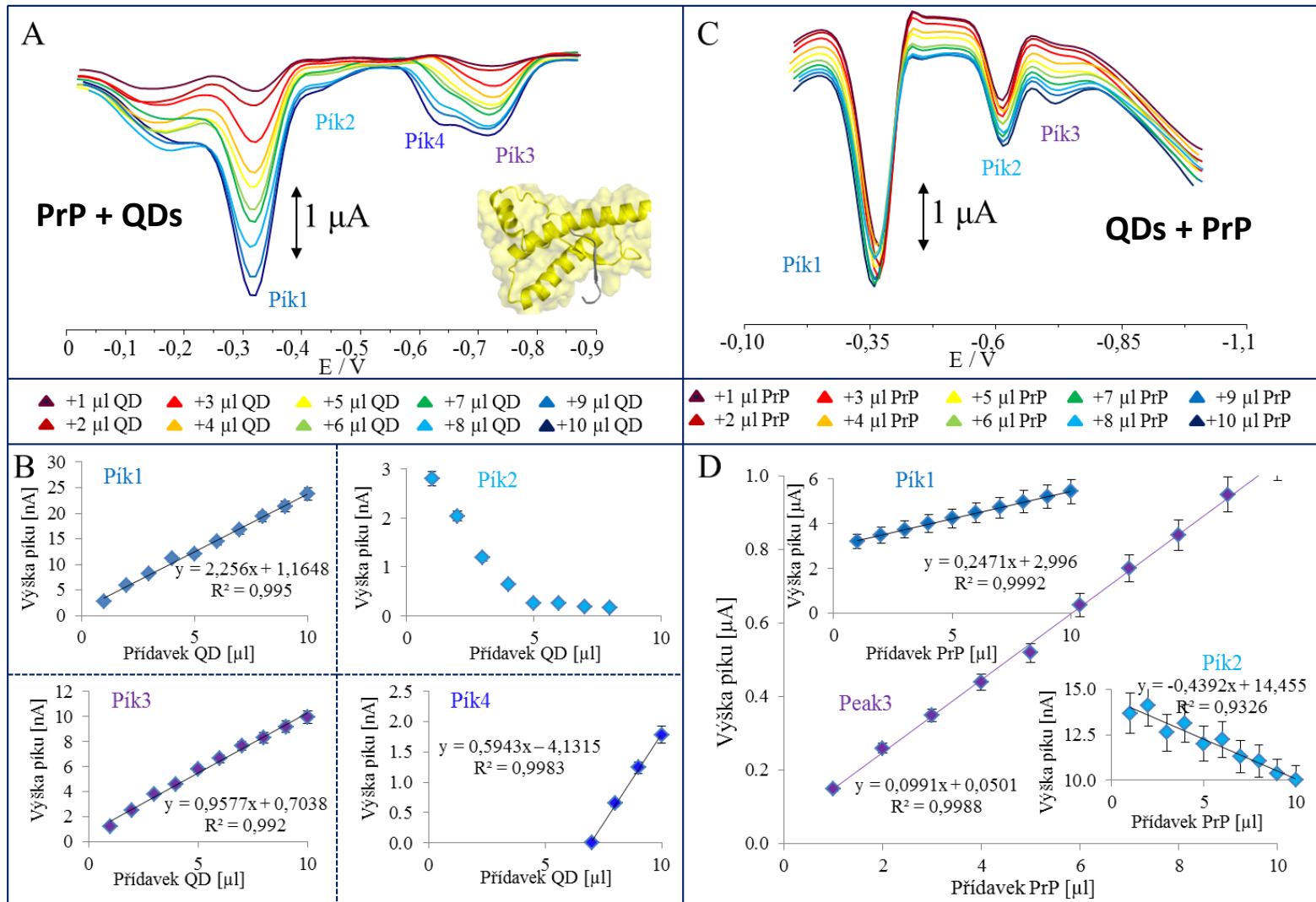
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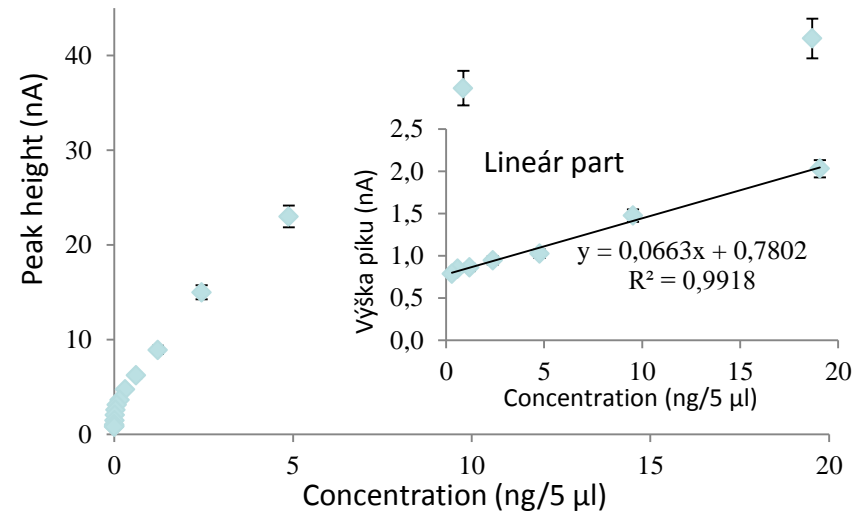
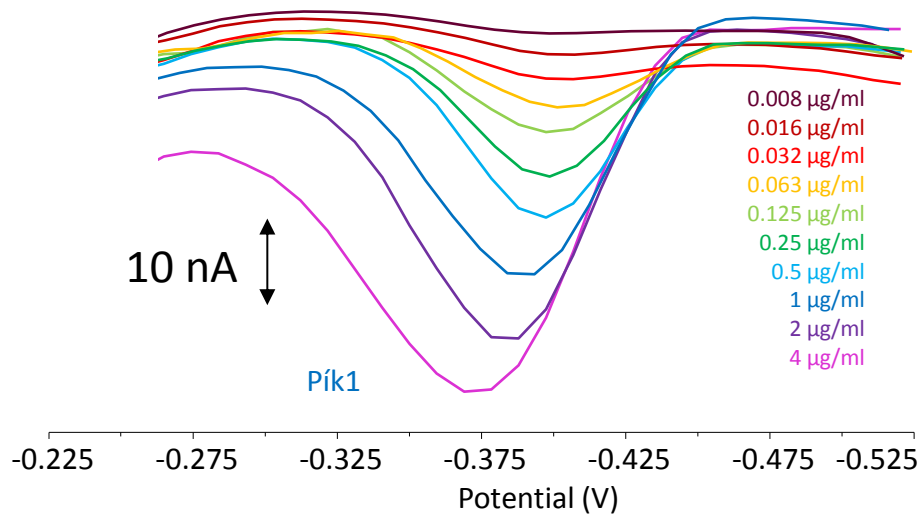
Bioanalytical tools:

Quantum dots-based biosensor for detection of prion proteins

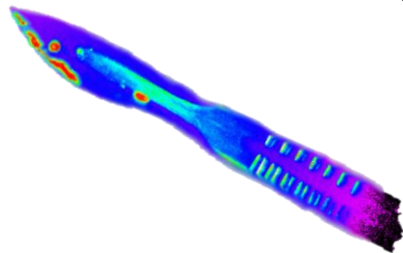


Bioanalytical tools:

Quantum dots-based biosensor for detection of prion proteins



Detection limit (3 S/N) 1 fg v 5 µl.



Detection of prion residues



Detection of neurodegenerative diseases

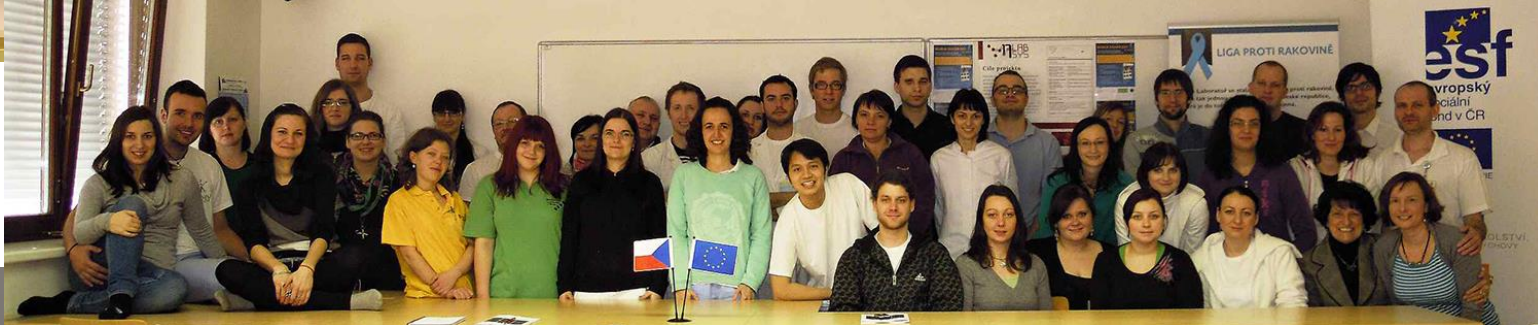
Acknowledgement

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