

Research project-PhD in Chemical Sciences

Biophotonic and bioelectronic sensing systems based on PNA and peptides for food and biomedical applications.

The position is sponsored by Cariparma and is in the frame of the **TeachinParma project**, aimed to host top-level world scientist teachers and supervisor of PhD students at the University of Parma. The student will thus be jointly supervised by **Prof. Roberto Corradini** (Organic Chemistry) at the University of Parma and by **Prof. Wolfgang Knoll**, Scientific Director of the Austrian Institute of Technology (expert of photonics and electronics), with **the possibility to acquire both Italian and Austrian doctorate**. The student will also collaborate with the group of **Prof. Maria Careri** (Analytical Chemistry) for the sensor testing and validation.

The program is meant to be highly **multidisciplinary and international**, and will involve first a synthetic part for designing and realizing sensing probes mainly peptide nucleic acids (PNA, figure 1) and peptides, then conjugation of the probes with nanostructured materials (inorganic nanoparticles and graphene), characterization of the materials and of their interactions with the biological target, and finally sensor development using both optical (plasmonic) and electronic (graphene-FET) sensor construction, optimization, and validation.

The student will be trained in many different techniques: modern organic synthesis procedures, peptide and PNA synthesis, methodologies for characterization of small molecules, of peptides and of PNA, fabrication and bioconjugation of nanomaterials and techniques for their characterization, sensor fabrication, optical and electronic measurements, optimization and validation of methods for food and biomedical analysis. The development of sensing devices will be carried out during period to be spent by the student at the Austrian Institute of Technology and at the University of Wien.

The program will also take advantage of the activities of **two ongoing European projects**: ULTRAPLACAD, aimed at the development of ultrasensitive plasmonic genosensor, and Oligo Nano-Med, a RISE project financing mobility of young researchers, aimed at the development of DNA- and PNA-conjugated nanostructured materials for biological applications; the latter will offer the possibility of mobility and collaboration of the PhD student to centers of excellence in the fabrication and characterization of nanostructured materials, such as the group of Prof. Luisa de Cola (ISIS-Strasbourg) and Prof. Michael Sailor (San Diego). For the flow chart of the research work, see figure 2.

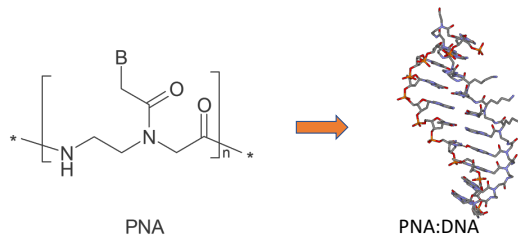


Figure 1. PNA and PNA:DNA duplex

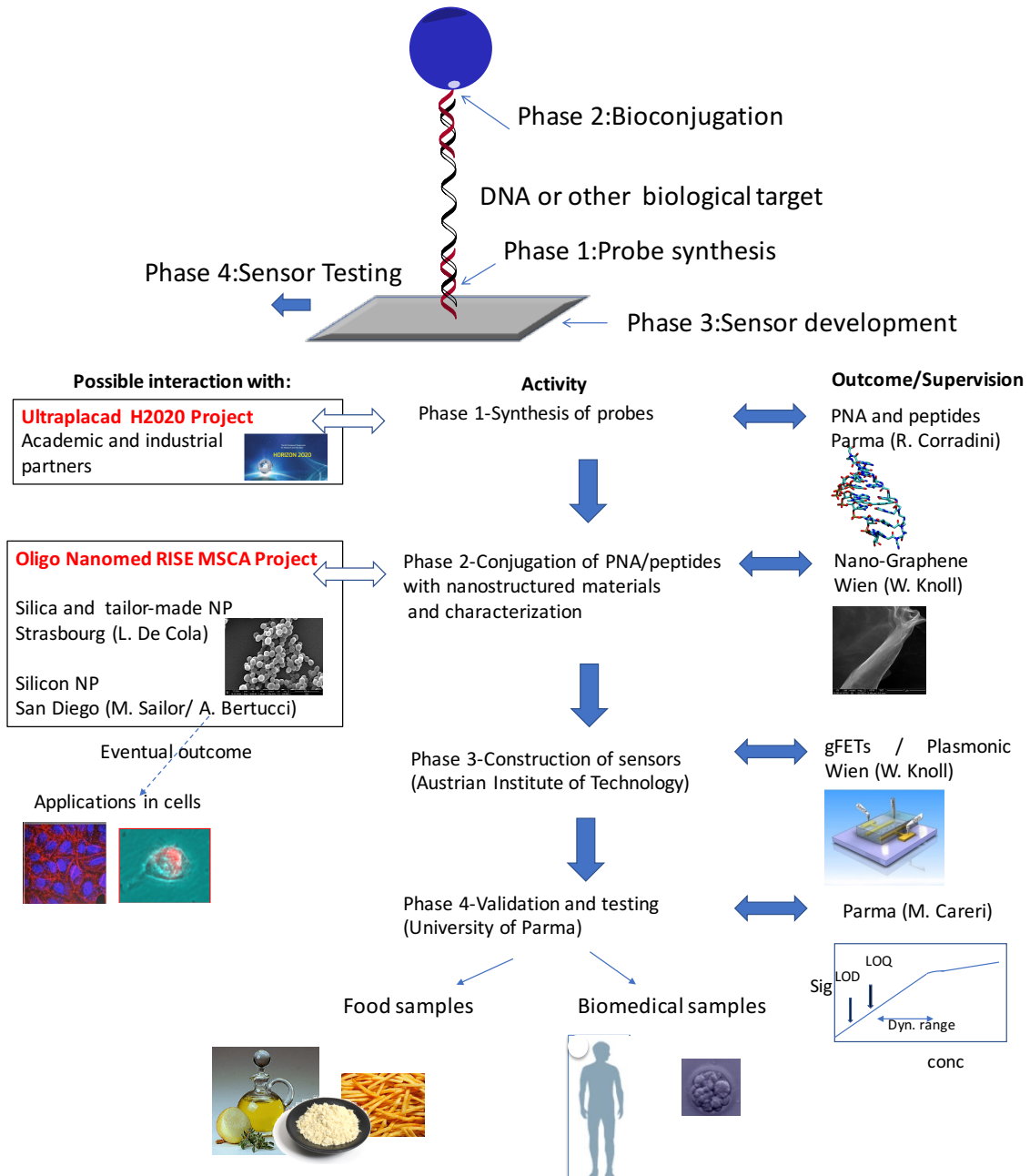


Figure 2. Phases and activities of the project