Open positions for the Marie Sklodowska-Curie fellows at the Laboratory for environmental and life sciences

The Laboratory for Environmental and Life Sciences (LELS) enables intensive collaboration of environmental and analytical chemists, biochemists, molecular biologists, eco-toxicologists and ecologists. Investigations conducted at LELS includes development of novel and unique ultrasensitive laser-based analytical methods, study of the fate, transport and transformations of pollutants in the atmosphere, terrestrial and aquatic environments, food quality and safety, biomedical diagnostic tools, as well as identification of recombinant antibodies specific for tumor biomarkers. Cutting edge research at LELS enables new insights into environmental processes at the level of molecules, cells, organisms and ecosystems, their interactions and interrelation with life processes in organisms and the human body, including cellular antioxidant activity, antimicrobial activities, biological processes regulating virus trafficking, cancer diagnostics and therapy.

Topic 1 : Generation of cross-reacting nanobodies for comparative oncology and liquid biopsy

Pet dogs have been proposed as animal models for oncological diseases since they develop spontaneous tumors with characteristics sufficiently similar to those of humans and are highly suitable for a comparative oncology approach to the identification of rare-tumor biomarkers suitable for liquid biopsy. The project will focus on the isolation of nanobodies that are able to recognize the same biomarkers in cells and extracelluar vesicles of human and canine samples. Such immunoreagents will be suitable for the diagnosis (and, potentially, therapy) of rare cancers.

Scientific requirements:

Ph.D. in biochemistry/molecular biology with experience in recombinant protein production, functionalization and biophysical characterization. Specific training in phage display and recombinant antibody technology will be highly appreciated

Topic 2 : Development of a high throughput in vitro testing battery for mixtures of chemicals

EFSA has developed a harmonised framework to evaluate the potential combined effects of chemical mixtures in food and feed. Cumulative risk assessment of pesticides is one area where EFSA is actively engaged in evaluating the risk to human health and the environment from exposure to chemical mixtures. The project will focus on the development of a simplified *in vitro* high-throughput testing battery

for human toxicity testing. The basic platform will serve for the evaluation of standard human toxicological endpoints, while additional testing batteries will be proposed and developed for selected organ-specific models. Two basic approaches will be applied as a read-out; fluorescence probes and high content imaging.

Scientific requirements:

Ph.D. in molecular or cell biology. Previous experiences in human toxicity testing or high throughput technologies related to high content imaging are highly appreciated.

Topic 3 : Breath Biomarkers and Air Pollution

Volatile organic compounds (VOCs) are ubiquitous in the environment and many are known hazardous air pollutants. In parallel, VOCs can be detected non-invasively in exhaled breath and in recent years have been the focus of many studies aimed at identifying diagnostic markers for various diseases, as well as monitoring metabolic processes and investigating the effects of diet and exercise. This project would work at the interface between environmental and life sciences, in the burgeoning field of environmental metabolomics. This includes the development of a methodology for the analysis of exhaled breath samples for the identification of markers of air pollution exposure based on mass spectrometry.

Scientific requirements:

PhD in analytical science and experience with mass spectroscopy. Experience with the measurement of environmental pollutants and/or chemometrics and metabolomics would be desirable.

Topic 4: Development of photothermal techniques for characterization of advanced materials

For materials showing changing optical properties with depth, classical transmission techniques can provide only the average values of measured parameters. In the case of thermal characterization the influence of the substrate, on which the examined thin film is deposited, on the measured signal is a key problem that can be solved by the use of photothermal beam deflection spectroscopy (BDS). This technique enables depth profiling measurements, which cannot be done by the use of classical methods, and determination of depth-dependent optical (energy band-gaps) and thermal properties (thermal diffusivity and conductivity) and properties that are related to them (carrier density), as well as structural properties (porosity, surface roughness), which can be determined indirectly on the basis of thermal properties. In the case of chemical characterization, the main obstacle is frequently insufficient sensitivity of the transmission or reflection spectrometric techniques,

which is associated with very short optical paths through the samples of thin and nanolayered materials. The solution is provided by the highly sensitive techniques, thermal lens spectroscopy (TLS) and microscopy (TLM), that show the capability of ultrasensitive detection of various analytes in sub μL samples with 100 μm optical paths or less, and offer a sample throughput of up to 20 samples per minute.

Scientific requirements:

PhD degree in physics or chemistry, or another closely related field. The candidate should have experience in handling and maintaining laser-based systems as well as a sound background in photothermal spectroscopy. Familiarity with microfluidics is considered an asset.

Contact person

Prof. dr. Mladen Franko (mladen.franko@ung.si).