

## PhD Thesis Project:

### New Strategies for Highly Accurate Absolute Quantification of Proteins via Cell-Free Labelled Protein Synthesis and ICP-MS/nanoESI-MS

Supervisor: Dr. James Barker (School of Pharmacy and Chemistry, Kingston University, [j.barker@kingston.ac.uk](mailto:j.barker@kingston.ac.uk))

Co-Supervisor: Dr. Marina Edelson-Averbukh (Department of Chemistry, Imperial College London, [m.edelson-averbukh@imperial.ac.uk](mailto:m.edelson-averbukh@imperial.ac.uk))

Collaborator: Prof. Wolf-Dieter Lehmann (German Cancer Research Centre, DKFZ, Heidelberg, [wolf.lehmann@dkfz-heidelberg.de](mailto:wolf.lehmann@dkfz-heidelberg.de))

Mass Spectrometry (MS) is the primary tool for identification and quantification of biomolecules, including proteins. Quantitative MS proteomics provides new insights into metabolic pathways, cell signalling processes, etc. Highly accurate protein quantification remains one of the key, elusive challenges of modern MS-based biotechnology. Recently, a novel method for accurate, absolute quantification of proteins has been established using cell-free synthesis<sup>1</sup> of stable, isotopically-labelled protein standards with inductively coupled plasma and nanoelectrospray MS (ICP-MS and nanoESI-MS)<sup>2</sup>. In this project, further development of absolute protein quantification strategies based on the ICP-MS will be carried out, aiming to reach unprecedentedly high levels of protein quantification accuracy, which will enable immediate applications of the new technology to challenging biological problems. Several approaches will be undertaken to reach the goal, including incorporation of halogenated amino acids into the protein standards. The project is a unique opportunity for a successful candidate to acquire skills in both atomic and molecular mass spectrometry approaches. The proteomic MS project will be carried out in collaboration with Imperial College London (Dr Marina Edelson-Averbukh) and German Cancer Research Centre (Prof Wolf-Dieter Lehmann).

#### **References:**

1. Katzen, F., Chang, G., Kudlicki, W., (2005) "The past, present and future of cell-free protein synthesis", *Trends Biotechnol.*, **23**, 150-156.
2. Zinn, N., Winter, D., Lehmann, W.D., (2010), "Recombinant isotope labelled and selenium quantified proteins for absolute quantification", *Anal. Chem.*, **82**, 2334-2340.