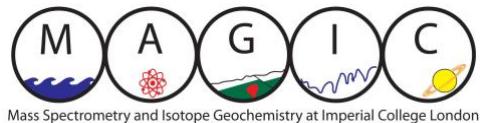
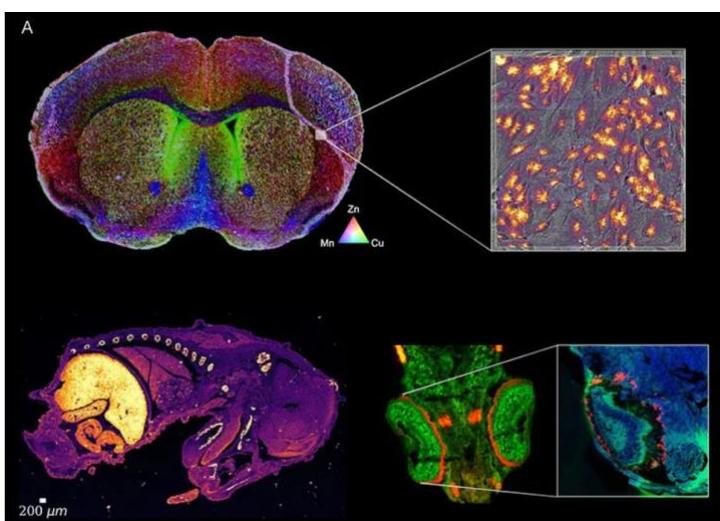


In Situ Metal Concentration Measurements in Biological Research



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The application of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for *in situ* elemental concentration measurements is well established within geochemistry. The use of such instruments in medical and life science research has only just begun, however, and the scope of applications is vast and exciting. Metals, such as iron and zinc are essential to animals and plants, and need to be regulated to specific levels in organisms (homeostasis), to support normal physiological functioning.



The images were generated via LA-ICP-MS at the LMF, and show the *in situ* concentrations of the biologically important metals zinc, manganese and copper in animal tissues.

In humans, significant imbalances in metal levels are induced by diseases (such as cancer), whilst homeostasis in plants can be disturbed by environmental factors, such as temperature, rainfall and soil quality. Understanding metal distributions in tissues that are affected by metal imbalances can hence provide novel mechanistic understanding of diverse biological processes and contribute to the characterisation of diseases. This project will employ LA-ICP-MS to carry out such investigations, with samples available to study cancer as well as the uptake and internal transport of metal micronutrients in plants.

Whilst the student will be part of the MAGIC Research group at the Department of Earth Science and Engineering of Imperial College (<http://www.imperial.ac.uk/earth-science/research/research-groups/magic/>), the LA-ICP-MS analyses will be carried out in collaboration with the London Metallomics Facility (LMF) at King's College London.

The inter-disciplinary nature of the project implies that the successful candidate will develop advanced skills in the application of LA-ICP-MS to analyse biological tissues, in image analysis (including via machine learning) and statistics, as well as for the interpretation of the results in a physiological context. Communication skills, to support effective exchange with diverse academic professionals from medical, life, natural and analytical sciences, will also be developed.

Applications from students with degrees in medical, life or natural sciences are welcome. Experience with programming (e.g., R, Python) are beneficial. Please don't hesitate to get in touch via email (r.moore13@imperial.ac.uk, markrehk@imperial.ac.uk) if you are interested or have further questions.

Recommended reading:

Doble, P. A., Gonzalez ed Vega, R., Bishop, D. P., Hare, D. J., Clases, D., 2021. Laser Ablation–Inductively Coupled Plasma–Mass Spectrometry Imaging in Biology *Chem. Rev.*, doi.org/10.1021/acs.chemrev.0c01219. This publication provides a general overview of LA-ICP-MS and the state-of-the-art of the technique in biological research.