X-ray Absorption Spectroscopy Imaging of Biological Systems: Localization of Chemical Species *in vivo*

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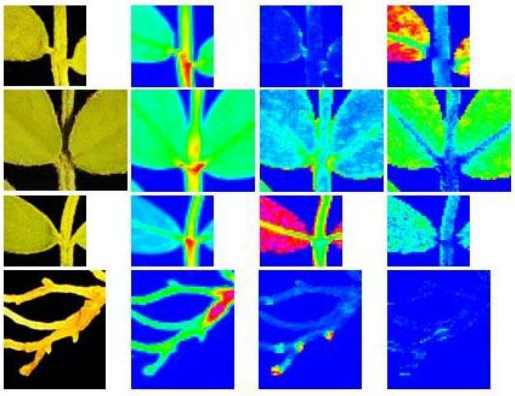
X-ray absorption spectroscopy is a versatile technique which yields chemical and structural information about a target element. X-rays penetrate easily through most forms of matter including through biological tissues, and the technique can be applied to determine chemical species within a complex biological system, in principle without pretreatment.

By using a small beam, tuning the incident energy above the absorption edge of the element of interest and rastering the sample, maps of the distribution of the element within living tissues can be developed. If we use the same beam but tune the energy to spectral features in the near-edge characteristic of different chemical forms of the element, we can go one step further and generate *in vivo* maps of different chemical forms within tissues. Thus, XAS imaging is a powerful technique for visualizing the localization of chemical forms within tissues and small organisms.

The talk will be illustrated with examples including selenium or arsenic in plants and insects. In particular, studies of the different chemical forms of arsenic in the arsenic hyperaccumulating fern *Pteris vittata* will be discussed.



XAS imaging of selenium species in *Astragalus bisulcatus,*a hyperaccumulator. See I. J. Pickering, R. C. Prince, D. E. Salt and G. N. George, "Quantitative, Chemically Specific Imaging of Selenium Transformation in Plants", *Proc. Natl. Acad. Science*, **97**, 10717-10722 (2000)