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**“Gilberto Vlaic”:**  
***Fundamentals, Methods and Applications***  
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**XAS (X-ray Absorption Spectroscopy) spectroscopy and Multiple Scattering Theory: method and applications.**

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X-Ray Absorption spectroscopy (XAS) is a powerful tool to investigate both the electronic and geometrical structure around to a well-defined absorbing atom belonging to any type of material, from biological samples to condensed matter. In these lessons I will present a general theoretical scheme, based on Multiple Scattering Theory, to analyze the XAS spectra, which allows a complete recovery of the experimental data from the edge up to very high energy.

The fundamental aspects of the theory will be presented in detail as well as some applications in various fields, from biology to coordination chemistry. In particular, I will discuss a new approach to get structural quantitative information using only the low energy part of the spectrum, starting from the edge. This procedure, that has been recently proposed in the literature, allows a complete three-dimensional determination of the local geometry around the photo-absorber in many different systems. Some applications in the field of time-resolved XAS and the use of molecular dynamics for the analysis of experimental spectra will be discussed in detail.