## New paradigms for the study of nanomaterials by advanced TEM methods

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The constantly growing field of nanotechnology has induced a remarkable progress on instrumentation related to electron microscopes including optics, automation reproducibility, and highly performant detectors. Before, it was usual to consider transmission electron microscopy (TEM) as a very useful but qualitative atom resolution imaging tool for materials science. Here, we will show several studies involving the fine physical and chemical characterization of nanosystems (nanoparticles, nanowires, nanotubes, etc.) developed at our group. These examples will be presented with the aim of stimulating the discussion of the need to change our views of experiment design, execution, and analysis. It is essential to exploit these advanced tools in association with meaningful physicochemical simulations, machine learning and big data processing, etc. to derive quantitative and statistically verified physical interpretation from experiments. We will also discuss the critical issue of human resource formation associated to complex modern analytical techniques.