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Laser Ablation Surface-Enhanced Raman Spectroscopy (LA-SERS) for the Characterization of Organic Colorants in Cultural Heritage¹

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The characterization of artistic practice throughout history often requires measurements of material composition with microscopic resolution, either due to the fine detail of the material composition or to the amount of sample available. This problem is exacerbated for the detection of organic colorants, which are often embedded in a complex matrix (e.g. oil, natural fibers) and in low concentration due to their high tinting strength. Surface-Enhanced Raman Spectroscopy (SERS) is increasingly used in detection of organic colorants in cultural heritage due to its high sensitivity and inherent preferential sensitivity to small organic molecules. This talk will discuss recent results from a new SERS measurement technique, in which laser ablation is used as a micro-sampling method onto a SERS-active film to characterize art samples with microscopic precision and sensitivity comparable to many mass spectrometry measurements. Furthermore, the nature of the sampling method provides built-in benefits to other SERS-based techniques, such as more quantitative characterization of mixtures, improved sensitivity to some analytes, and reduced background interference. Examples will be shown for measurements of reference materials and art objects, including a restored 16th-century dish and a Renaissance fresco, *The Incredulity of San Thomas*, by Luca Signorelli.

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