Photonics for the diagnostics: biomedical and cultural heritage applications (abstract)
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The training will introduce cutting-edge photonics methods for diagnostics in both the biological and cultural heritage field.

For biological tissues and pathological assessment, the development and integration of multiple laser scanning imaging techniques offer the capability to capture high-resolution images of tissues without the need for any exogenous marker. Such a multimodal approach is an alternative to traditional histopathological methods for diagnosing tissues since it allows the integration of morphological information with functional information and correlates the molecular and cellular changes observed with the development of diseases. In addition, the implementation of optical techniques in fiber optic sensors also offers the potential for both exo- and endoscopic clinical applications, paving the way for the clinical translation of the technologies. The methods described here are applied to a wide range of tissues (skin, brain, colon, bladder, cornea) in close collaboration with medical specialists.

Spectral imaging techniques, deriving from the interaction of the electromagnetic radiation in specific spectral ranges, give valuable information on the materials composing a painting depending on the selected wavelengths. Besides the analytical investigation of the paint materials, high-quality images allow to investigate the preparatory phases and the realization techniques of the masters. Morphological and stratigraphic information, acquired in a non-invasive and non-contact way, provide an added value for the painting analysis as well as for the monitoring of cleaning procedures. Three advanced prototypes for the analysis of paintings will be presented: a scanning device for the multispectral reflectography in the visible-near infrared spectral range; a micro-profilometer for high-resolution 3D survey and a confocal time-domain OCT (Optical Coherence Tomography) device for the stratigraphy without any sampling.