

3-D virtual slicing of an antique violin reveals ancient varnishing methods

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Italian violin-making masters of the distant past developed varnishing techniques that lent their instruments both an excellent musical tone and impressive appearance. Few records from this era have survived, as techniques were most often passed down orally to apprentices; only

scarce information is available on the original methods used for finishing the instruments.

In a new study published in *EPJ Plus*, Giacomo Fiocco, affiliated with both Pavia and Torino Universities in Italy, and his colleagues use the [synchrotron](#) facility in Trieste to develop a non-invasive 3-D-scanning approach that yields insights into the main morphological features of the overlapping finishing layers used on violins. In turn, the morphological images can be used to determine the chemical nature of the coating. This newly developed method could help scientists rediscover the procedures and materials used, and reproduce the multi-layered coating methods of the ancient masters.

In this study, the authors rely on a 3-D scanning [method](#), called Synchrotron Radiation micro-Computed Tomography (SR-micro-CT). Moreover, they employ the Elettra Synchrotron Trieste synchrotron, a beam of accelerated particles that produces a high flux of radiation spread over a continuous spectrum extending from infrared to hard X-rays.

The authors first use the X-ray beam to scan two sets of mock-ups, which were prepared in their lab to mimic the finishing layers on the historical instruments. Using the mock-ups, they then optimise the 3-D scanning settings, boost the [spatial resolution](#) and define the parameters required for 3-D reconstruction. The authors then focus on a large fragment removed from a damaged cello made by the 17th-century Italian luthier Andrea Guarneri. Lastly, they compare their findings with those produced by micro-invasive analyses of the varnish to evaluate the merits of the reconstructed volumes and virtual slicing in terms of investigating such layered, complex structures.

More information: Giacomo Fiocco et al, Synchrotron radiation micro-computed tomography for the investigation of finishing

treatments in historical bowed string instruments: Issues and perspectives, *The European Physical Journal Plus* (2018). DOI: [10.1140/epjp/i2018-12366-5](https://doi.org/10.1140/epjp/i2018-12366-5)

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