Fibre identification on cultural heritage - optical versus electron microscopy

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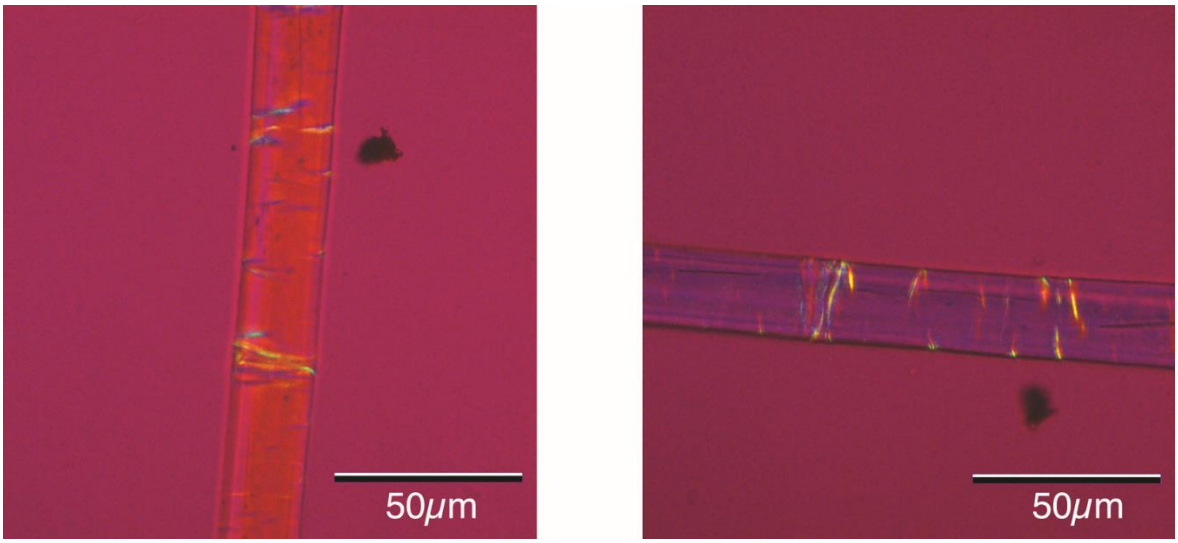
Textiles have been very important for society throughout history. In many areas of the world, they have been as critical for survival as food and water and have always played a principal role in countless ways [1]. The areas of textile use span broadly: clothing; furnishing; art; sails; fishing nets; packing as well as recycled textiles used for paper making until the 19th century. Preserved textile objects constitute a rich source for archaeological, historical, and cultural heritage research.

Even though only natural fibres were available up to the 1880s, when semi-synthetic and synthetic fibres were introduced [2], there had been a huge variety of natural resources having either cellulose-, protein- or inorganic origin. Information about what kind of materials have been used to produce different textile objects is essential because it provides knowledge about the infrastructure and resource management in the societies where the objects were made and used. It can give hints about provenience or even authenticity of a historical object.

While animal and plant fibres (not to mention metal and mineral fibres) are relatively easy to distinguish between each other, it can be very difficult to distinguish between different types of plant fibres [3-5]. However, it is still quite common that material type is not analyzed by proper methods, instead estimations are based on superficial observations. Even journals with a high scientific reputation have been known to publish claims that are not properly supported by evidence [6].

This paper will present an overview of how optical and electron microscopy can be applied in the identification of fibres. A series of measurements on ancient textiles as well as modern reference samples will be presented and some of the particular challenges related to fibre identification will be highlighted, with the hope that it may kindle suggestions for solutions from the audience.

Remains of an oval shaped Viking Age brooch recently discovered in Spurkeland, Lindås, Vestland with textile fragments, the first half of the 10th century AD, © University Museum of Bergen, Hana Lukesova



Result of the modified Herzog test on an archaeological plant fibre, Polarized Light Microscopy, © University Museum of Bergen, Hana Lukesova.

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