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## **An English medieval embroidered folded almanac: identification of the dyes**

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The folded almanac MS.8932, written in Latin and produced in England around 1400, is a remarkable artefact. Astronomy and astrology played a significant role in medieval life, and calendars, based on Metonic cycles, enabled the sun and moon's movements to be predicted. Almanacs containing these calendars became increasingly popular with a wide range of users, including the clergy who used them to forecast the dates of religious festivals, and medical practitioners who related celestial activity to health.

MS.8932, previously in a private collection, was purchased by the Wellcome Library in London in 2013. It is a small book (H160 x W38 x D21 mm) consisting of eight vellum leaves sitting within an embroidered binding. The leaves are joined at their extended tabs and folded three times to fit within the covers. Few examples of this type of medieval folded manuscript have survived. It was probably worn hanging from a belt. On the opening page, John Somer identifies himself as the author and his text contains a calendar with additional information, including the Zodiac Man, a diagram depicting the association of the signs of the zodiac with specific parts of the human body. The brief but practical nature of the text suggests its use as a working manual. On the other hand, MS.8932's exquisite embroidered binding is unique and indicates a prestigious artefact. Each cover is made of three layers: woollen fabric, vellum and linen embroidered with silk, all stitched together around the edge. Braids sewn down the middle may once have extended out beyond the binding, to fasten the almanac and create an attaching handle. The study of medieval embroidery has been limited by its poor survival rate. MS.8932 therefore presents an unrivalled opportunity to learn more about bindings, embroidery and production methods dating from the medieval period.

The identification of the dyes in the embroidery was achieved by means of micro-invasive techniques such as Surface Enhanced Raman Spectroscopy (SERS) and HPLC-MS. Despite the small size of the micro samples (less than 2 mm of very thin threads), it was possible to identify orchil for pink hues, indigo/madder double dyeing with aloe (possibly used as mordant and/or as antibacterial agent) for purple hues, and indigo/weld double dyeing for green hues. This information will enable comparisons to be made, helping to situate the artefact and understand its significance.