State-of-the-art science reveals secrets of 19th century fashion industry

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The dye industry of the 19th century was fast-moving and international, according to a state-of-the-art analysis of four purple dresses. The study, published in *Spectrochimica Acta, Part A: Molecular and Biomolecular Spectroscopy*, reveals that a brand new purple dye went from first synthesis to commercial use in just a few years.

Before the 1800s, purple dye came at a premium, so it was usually restricted to royalty—hence the connection between royals and purple. The 19th century saw the discovery of several synthetic purple dyes, making purple textiles more affordable and readily available. Understanding where these dyes came from and were used is therefore of historical interest.

In the new study, researchers from CSIRO Manufacturing and the National Gallery of Victoria in Australia show that the new purple dyes were part of a fast-moving industry, going from first synthesis to commercial use in as few as four years. This reflects how dynamic the fashion industry must have been at the time.

"Chemical analysis has given us a glimpse into the state of the dye industry in the 19th century, revealing the actual use of dyes around the world," said Dr. Jeffrey Church, one of the authors of the study and principal research scientist at CSIRO Manufacturing.

The researchers took small samples of fibers from four dresses: three 19th century English dresses and one Australian wedding gown. They

extracted the dyes from very small silk yarn samples and analyzed them using a combination of chemical techniques: thin layer chromatography and surface enhanced Raman spectroscopy, Fourier transform infrared spectroscopy and energy dispersive x-ray spectroscopy.

They found that the three English dresses were dyed using methyl violet; one of them was made only four years after the dye was first synthesized.

"The dress containing methyl violet was made shortly after the initial synthesis of the dye, indicating the rapidity with which the new synthetic dyes were embraced by the textile dye trade and the fashion world of the day," commented Dr. Church.

However, the Australian wedding dress incorporated the use of a different dye—Perkin's mauve—which was very historically significant, as it was the first synthetic purple dye and was only produced for 10 years. This was a surprise to the researchers, as the dress was made 20 years after the dye had been replaced on the market.

"The dress in question was made in Australia," explained Dr. Church. "Does the presence of Perkin's mauve relate to trade delays between Europe and Australia? Or was this precious fabric woven decades earlier and kept for the special purpose of a wedding? This is an excellent example of how state-of-the-art science and technology can shed light on the lives and times of previous generations. In doing so, as is common in science, one often raises more questions."

More information: Andrea L. Woodhead et al. The purple coloration of four late 19th century silk dresses: A spectroscopic investigation, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* (2016). DOI: 10.1016/j.saa.2015.10.024

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