

TECHNOLOGY

Modern science takes historic maps into new territory

A ground-breaking new project is revealing the secrets of two of the Bodleian Library's greatest treasures.

Vanessa Collingridge reports

Created centuries ago to record unfamiliar terrain, two historic maps are now themselves the subject of a ground-breaking project – to reveal the secrets hidden within them.

The priceless artefacts – the 17th-century Selden Map of China and the medieval Gough Map of Britain – are both held at the Bodleian Library in Oxford. It is there that experts are analysing the documents using a range of analytical techniques, brought together for what is thought to be the very first time.

The Selden Map was created in the early 1600s and details the system of navigational routes around east Asia, India and the Middle East. The Gough Map, meanwhile, was drawn up between around 1300 and 1430 and is thought to be the first 'British' map of Britain.

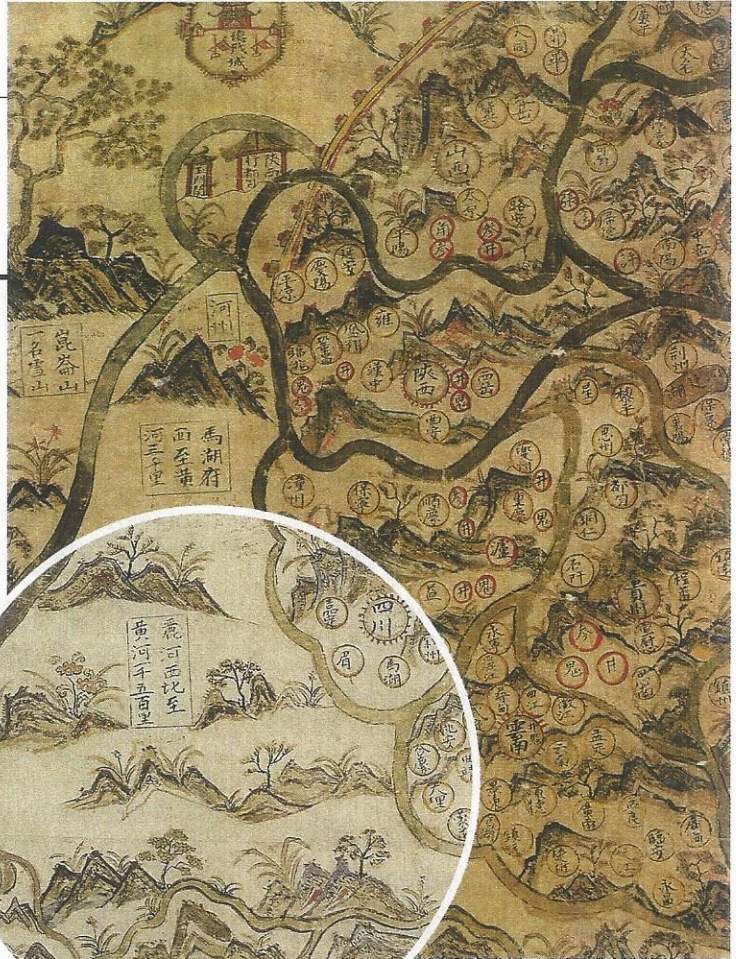
The new project's principal investigator, Catherine Delano-Smith, told *BBC History Magazine*: "The Gough Map is such an enigma: there's simply nothing like it in England or indeed most of Europe at the time, or for 200 years afterwards. We just don't have the information we need to say for sure when this remarkable document was created, by whom and why, so the priority here is to give what we hope will be a definitive description, including

a date, and the history of how it was altered and updated. Ideally, we'd like to get enough data from these experiments to help us reach answers that we just couldn't get by using traditional methods."

The project, which was part-funded by a £15,000 grant from Queen Mary University, relies on three key pieces of equipment, provided by the universities of Durham and Northumbria, the Rutherford Appleton Laboratory and science and technology firms Headwall Electronics and Factum Arte.

Firstly, a 3D scanner creates a detailed 'relief map' of the document's surface by passing a laser across the map and filming it from each side with a video camera. The resulting image shows tiny marks and evidence of stretching or reworking, and can reveal ghostly indentations left by a scribe's pen even if the original ink is no longer visible.

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Maps and legends

The famous 17th-century Selden map in its original and (inset) restored states. The map is being explored using the latest technology

Meanwhile, the maps' chemical secrets are being revealed using hyperspectral imaging and Raman pigment analysis. The former uses a beam of white light composed of bands of coloured, near infrared and ultra-violet light to produce a high-resolution digital 'map' of the inks or materials used to create the artefact. By using different colour combinations, scientists can highlight features invisible to the naked eye, enabling them to reveal details unseen for centuries. These include place names and features that have been deliberately erased, amended or painted over, or have flaked off or worn away.

The final technique, Raman microscopy, uses the scatter of light from a laser to pinpoint the unique chemical signature of the different pigments used on the maps. This gives detailed information about the pigments' molecular make-up, which can be used to identify them, and also, as different pigments were used at different points in history,

to help date the original artefact and any later revisions.

Critically, the work is non-invasive and can be done on site, meaning that there is very little risk to the maps. Bodleian Library's head of conservation research, David Howell, says that this is key: "I wasn't sure what we'd find but I'm blown away by the data that's already coming out. I couldn't be happier: these are world-leading technologies, so to get one would have been impressive, but to get all three at once is completely amazing. It's taken three years of planning to get here but it's only the beginning. Our biggest problem now is there's just so much data to sort through to fully explore what we've uncovered!"

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Vanessa Collingridge is a historian who has presented programmes including BBC Radio 4's *Making History*