

# DETECTING ARSENIC IN 19th CENTURY BOOKS USING LIGHT

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## 1. Background

Bookbinders of the 19th century used toxic arsenical pigments for their vibrant green colour.



Time has passed and arsenical books are still in circulation, in libraries, bookshops, or personal collections. In recent years, awareness of the hazard has risen among collecting institutes and thousands of potentially toxic books have been quarantined.

## 2. Current problem

Visual identification is difficult and inaccurate.

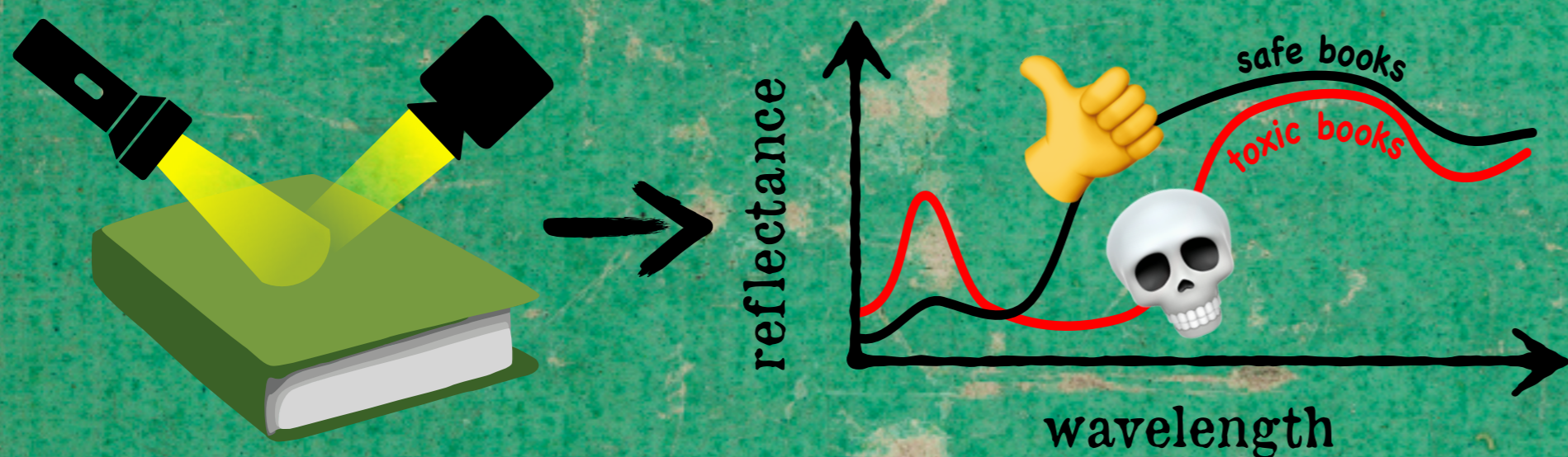


Instrumental methods exist (Raman and X-ray fluorescence spectroscopy) but are not suitable for large scale testing as they are slow, expensive (tens of thousands of pounds of equipment), require data analysis and specialised personnel.

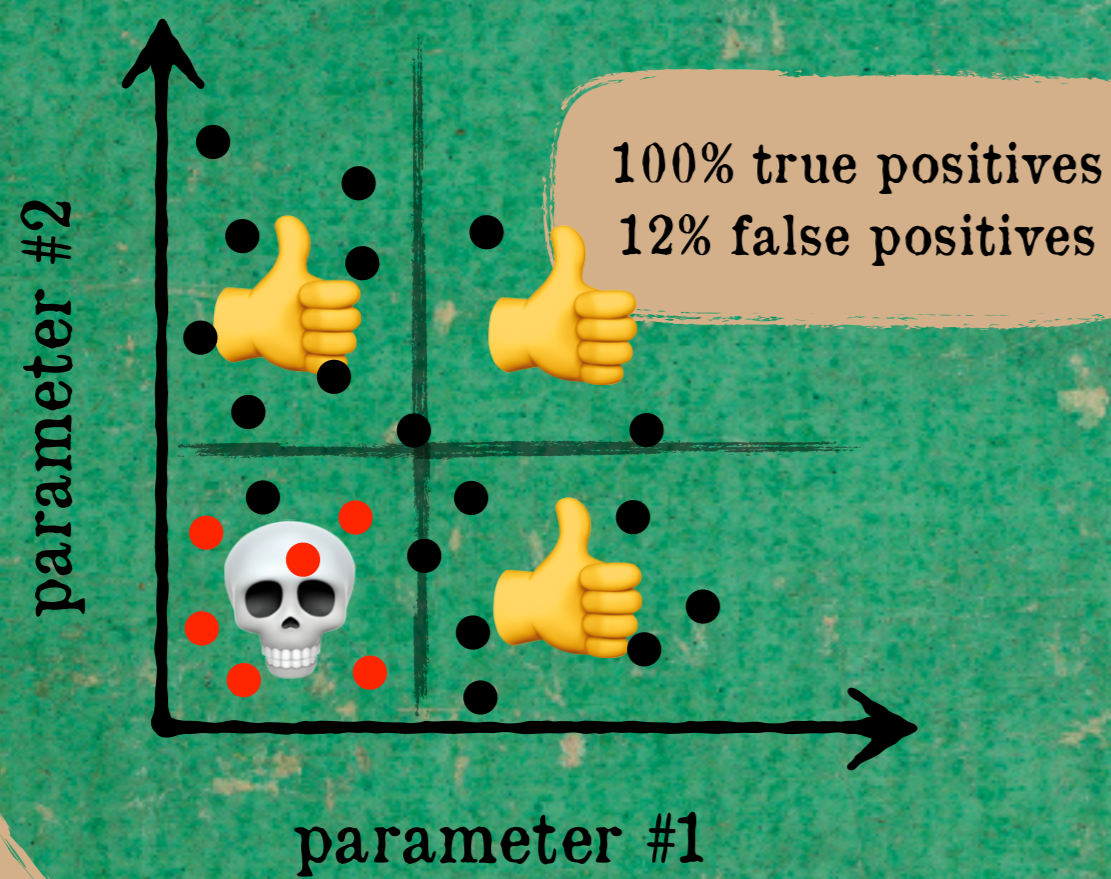
As a result, thousands of quarantined books remain untested, in the absence of a solution.

## 3. Our study

We measured the optical properties of hundreds of safe and arsenical books in search of a signature of Arsenic.



We found a pattern in the reflectance spectrum that strongly correlates with the presence of Arsenic. A two-parameter analysis of the spectrum is used to identify this pattern:

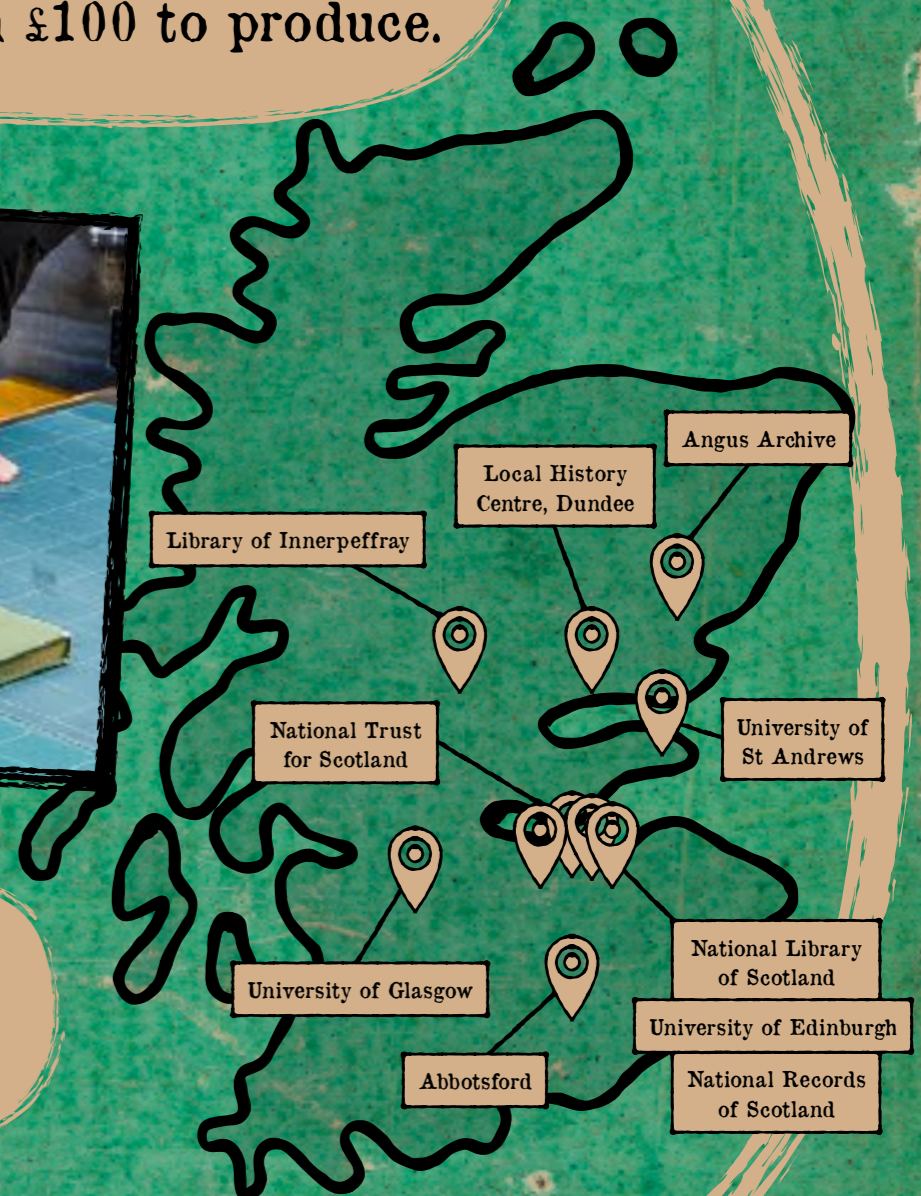


## 4. Our prototype

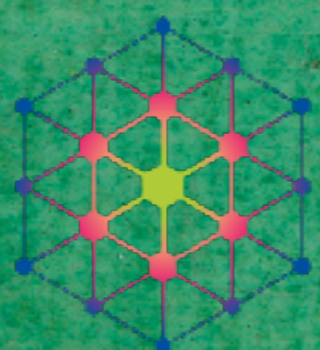
We built a hand-held device that automatically performs this analysis. It gives an instant "safe" or "toxic" result in a few milliseconds, and costs less than £100 to produce.



Our device is currently being deployed in Scottish collecting institutes for large scale testing.



Funding



PHOTONICS & Quantum Accelerator



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