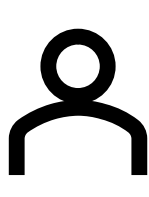



Portable Hyperspectral Imaging (pHI) for the enhanced recording of archaeological features

 **Nicholas Crabb**  crabbn@bournemouth.ac.uk  [linkedin.com/in/nicholas-crabb1/](https://www.linkedin.com/in/nicholas-crabb1/)
Department of Archaeology and Anthropology, Bournemouth University (UK).

INTRODUCTION

- Physical attributes of archaeological soils and sediments are conventionally recorded through subjective description, digital photography, and illustration.
- More labour-intensive laboratory and geochemical analysis can yield deeper insights into past-human activity but are difficult to implement at large scales.
- 'portable' hyperspectral sensors have the capacity to overcome this by providing an enhanced characterisation and classification of archaeological features 'in situ'.

METHODS

- Record features using a Specim IQ pHI at BU's Archaeological Field School.
- Calibration panel used to correct for different light conditions.
- Imagery analysed using ENVI, including PCA and K-Means classification.

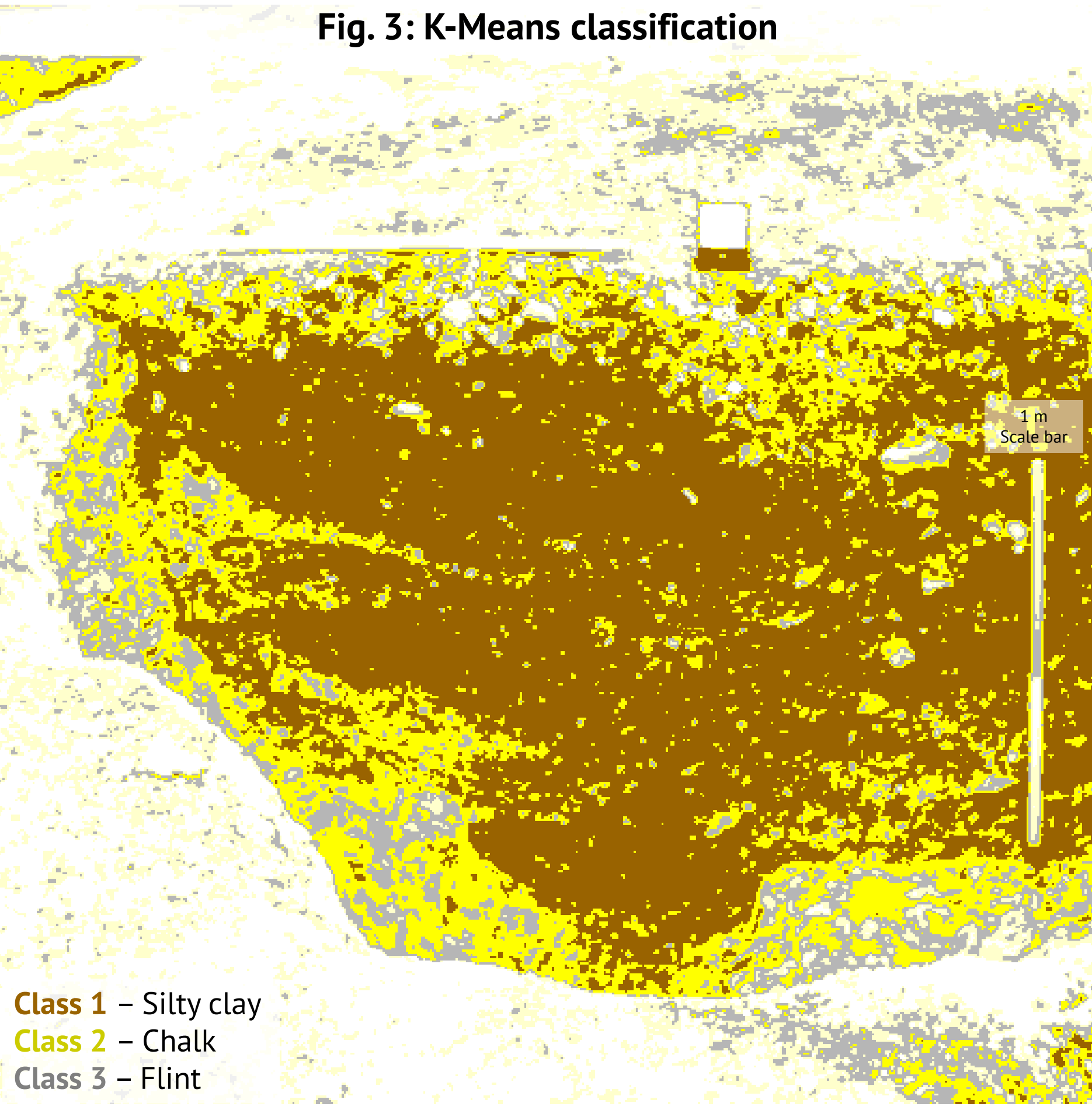
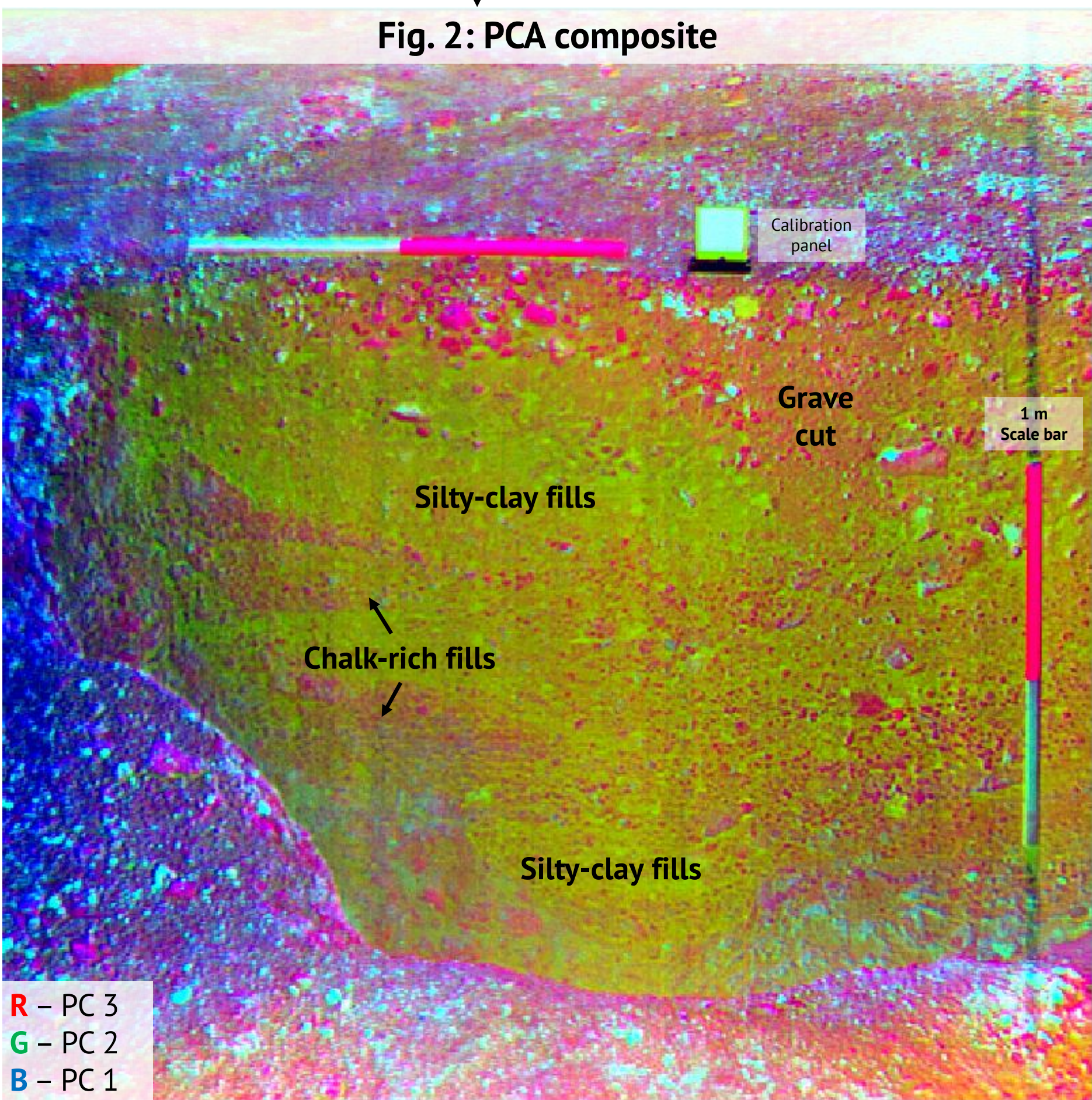
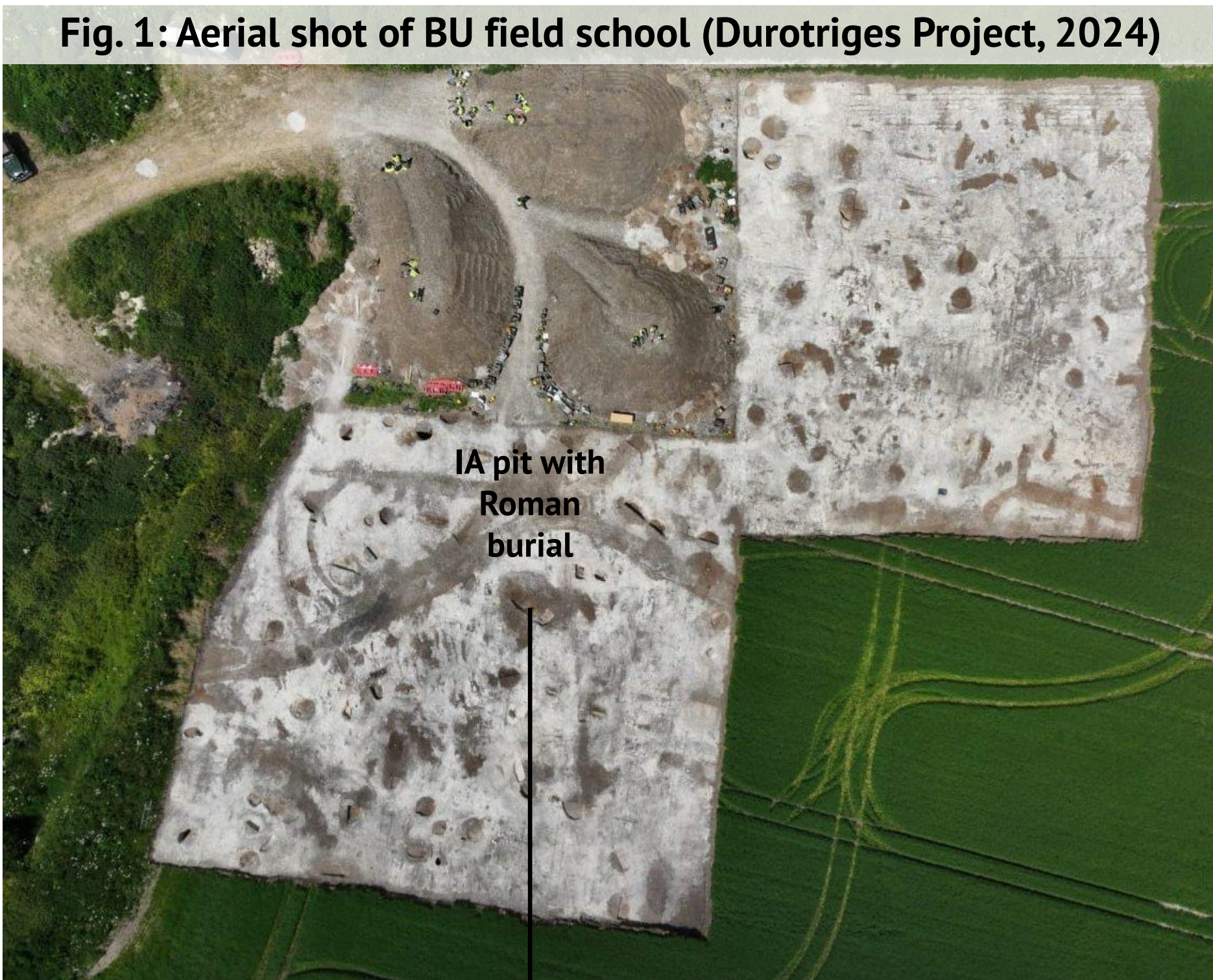
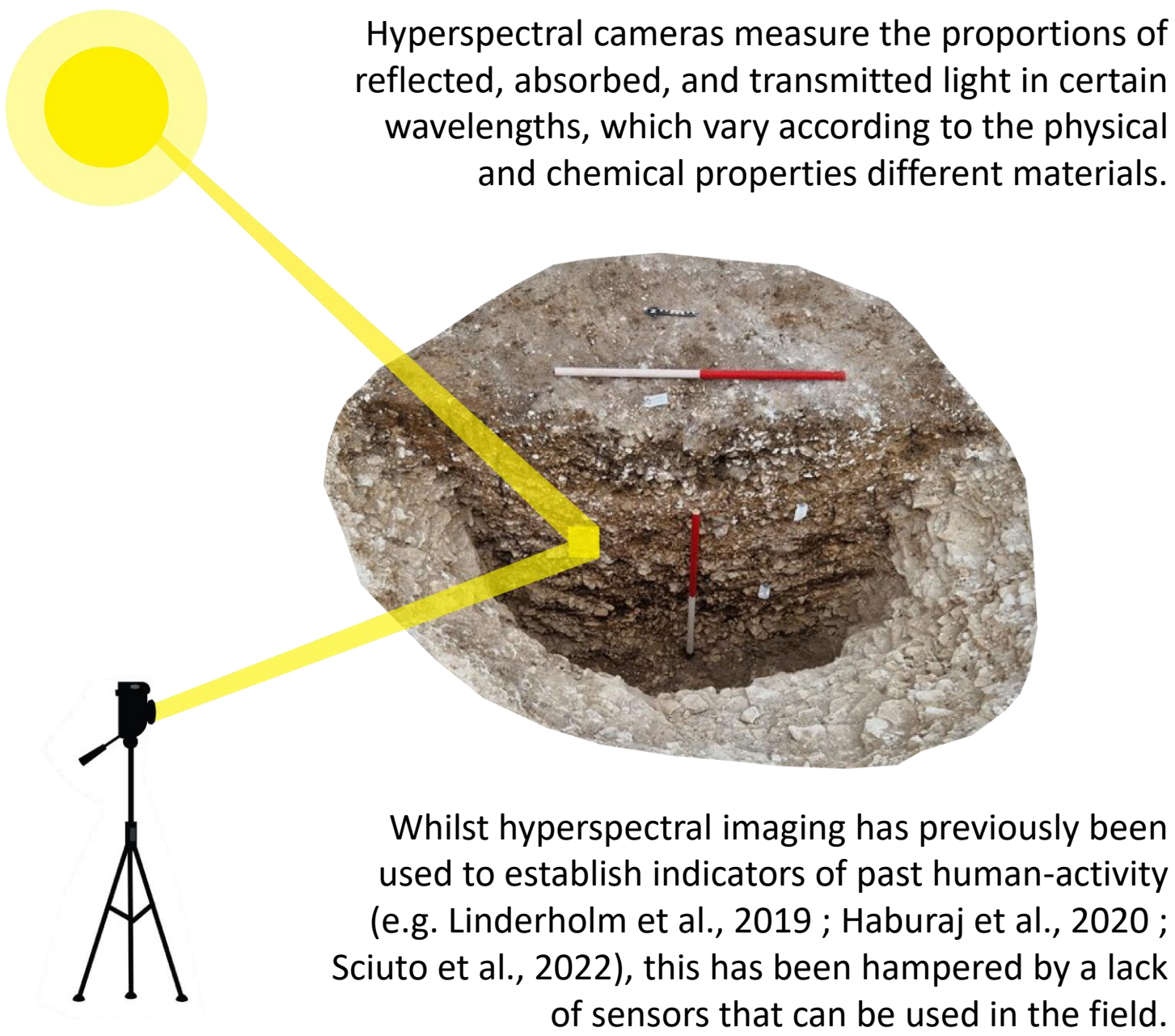
RESULTS

- Iron Age pit with silty-clay layers and chalk eroding from the sides was recorded (Fig. 1).
- This contained a later (Roman) grave, which was more clearly defined in a composite image comprising the first three bands of the PCA, than in RGB imagery (Fig. 2).
- The K-Means classification was further successful at defining difference between the chalk-rich and silty clay material (Fig. 3).
- However, analysis of individual spectral profiles was required to elucidate more subtle differences in the composition of materials.

DISCUSSION

- An enhanced definition of materials can be achieved using pHI and through image processing / classification.
- Spectral differences likely relate to variations in organic content, but other parameters (e.g. geochemistry) also contribute to this.
- Further comparison with other datasets is required to help clarify this.

Feature	Specifications
Wavelength band	400 – 1000 nm (VNIR)
No. of spectral bands	204 (each band 2-3 nm)
FOV at 1 m	0.55 x 0.55 m
Spatial sampling	512x512 pixels
Data format	ENVI (.dat) compatible



Scan for
more info

References:
Haburaj et al. 2020. Coupling spectral imaging and laboratory analyses to digitally map sediment parameters and stratigraphic layers in Yeha, Ethiopia. *PLOS ONE*, 15, 9 : e0238894. DOI : 10.1371/journal.pone.0238894.
Linderholm et al. 2019. Near infrared and hyperspectral studies of archaeological stratigraphy and statistical considerations. *Geoarchaeology*, 34, 3 : 311-321. DOI : 10.1002/gea.21731.
Sciuto et al. 2022. What Lies Beyond Sight? Applications of Ultraportable Hyperspectral Imaging (VIS-NIR) for Archaeological Fieldwork. *Journal of Field Archaeology*, 47, 8 : 522-535. DOI : 10.1080/00934690.2022.2135066.