

RAMAN SPECTROSCOPIC ANALYSIS OF AN IMPORTANT PRESERVED SPECIMEN OF HUMAN HAIR

N. F. Nik Hassan¹, H. G. M. Edwards¹ and A. S. Wilson²

¹Department of Chemical and Forensic Sciences, University of Bradford, BD7 1DP, UK; E-mail: N.F.nikhassan@bradford.ac.uk

E-mail: h.g.m.edwards@bradford.ac.uk

²Department of Archaeological Sciences/ Biomedical Sciences, University of Bradford, Bradford, BD7 1DP, UK

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Abstract: We report the Raman spectroscopic analysis of hair specimens of the British Railway engineer, Robert Stephenson and scientist, Sir Isaac Newton. The former is a documented sample from an archive in the National Railway Museum, York, UK. Samples have been analysed using the Renishaw “Invia” confocal Raman microscope operating at 785nm.

Previous studies in our laboratory have successfully characterized human tissue from a range of archaeological and depositional environments. Specimens include skin, bone, hair, nail and teeth from prehistoric mummies, Roman and early mediaeval burials to recent times [1,2,3,4]. The results have yielded information about biomaterial degradation and the diagenesis of the keratotic components of hard and soft tissues [5]. In this recent study on hair specimens, Raman microscopy has been used to obtain spectra from single hair of Robert Stephenson (aged ~150 yr) and Sir Isaac Newton (~250 yr). The former are a mixture of brown and grey but the latter is only grey. Both hair specimens, histologically depict good structures. Fig. 1 shows the stack-plot of Raman spectra of Robert Stephenson and Isaac Newton’s hairs, together with modern grey hair and powder of keratin. Both hair spectra show little evidence of degradation and indicate the fibres are healthy and in good state of preservation, which does not reflect their age.

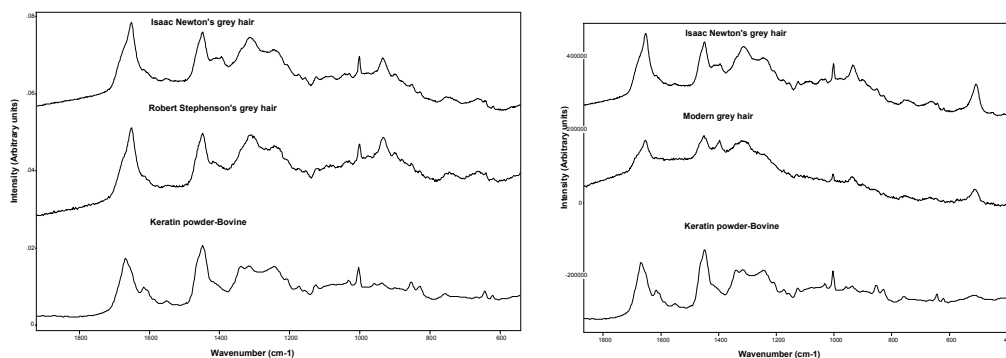


Fig. 1. Left: Raman spectra of hair of Isaac Newton, Robert Stephenson and bovine keratin for comparison.

Right: Raman spectra of hair of Isaac Newton, modern grey hair and bovine keratin.

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References:

1. W. Akhtar, H.G.M. Edwards, D.W. Farwell and M. Nutbrown, *Spectrochim. Acta.* **53**, 1021 (1997).

2. A.S. Wilson, H.G.M. Edwards, D.W. Farwell and R.C. Janaway, *J. Raman Spectrosc.*, **30**, 367 (1999).
3. M. T. Kirchner and H. G. M. Edwards, *J. Raman Spectrosc.* **28**, 171 (1997)
4. A. C. Williams, H. G. M. Edwards and B. W. Barry, *Biochim. Biophys. Acta*, **1246**, 98 (1995).