Forensic textile science

Example of fabric debris recovered from gun-shot wound track

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Acknowledgements

My Fellowship experience was amazing, I learnt so much. However, I couldn’t have done any of this without the Winston Churchill Memorial Trust (UK); Cranfield University and colleagues at Cranfield especially my Head of Group Professor Ian Horsfall; the many people I visited and stayed with and Franklin who kept the family going while I was away.

Itinerary

*Monday 10th September – Friday 14th September 2012 Canberra, Australia*

meeting with Paul Tys CEO WCMT Australia
Conservation Department of the Australian War Memorial
Professor James Robertson (Forensic Studies, Canberra University) and Dr Jane Hemmings (Australian Federal Police)

*Monday 17th September – Friday 21st September 2012 Melbourne, Australia*

DSTO (Defence Science and Technology Organisation)
Diggerworks, Defence Materiel Organisation
The Mortuary Team at Victorian Institute of Forensic Medicine
dinner with Melbourne based WCMT Fellows
Mac Fergusson of RMIT (Royal Melbourne Institute of Technology)

*Monday 24th September – Thursday 11th October 2012 Dunedin, New Zealand*

Liz Girvan at the Otago Centre for Electron Microscopy, University of Otago
Professor Jules Kieser at the Sir John Walsh Research Institute, University of Otago
drinks with Dunedin based WCMT Fellows

*Friday 12th October Christchurch, New Zealand*

Dr Mike Taylor at ESR and Dr Mark Jermy at the University of Canterbury

Introduction

Textile products (apparel, ropes, furnishings) are routinely collected as sources of forensic evidence. However, the examination of such evidence from a textile science perspective is a relatively young discipline that originated with Australian Federal Police (Canberra). Fibre identification is well-developed, but the use of textile damage as supporting evidence less so. I first got involved in forensic textile science about 7 years ago while working in the Textile and Clothing Sciences Department at The University of Otago in Dunedin, New
Zealand. Dr Taylor from ESR Christchurch\(^1\) approached Professor Kieser and I to start researching the underlying science of damage to fabrics via a series of Masters projects. These projects, and work completed since, have established forensic textile science in the international academic forensic literature via a series of journal articles:


The primary aims of my Fellowship were to:

i) develop international collaborative relationships with leading researchers at Australian Federal Police in the area of forensic textile science,

ii) conduct collaborative research in the broad area of clothing damaged during alleged sexual assaults, and

iii) investigate bullet damage to fabrics and underlying bony structures.

**My Fellowship**

My fellowship was based in four locations, two in Australia and two in New Zealand i) Canberra, ii) Melbourne, iii) Dunedin and iv) Christchurch.

**Canberra**

In Canberra I met with Paul Tys, CEO of The WCMT (Aus). The Trust is based on the ANU campus; Paul and his team were incredibly welcoming, and we talked about my Fellowship and the process of applying in the UK and Australia. I spent a fascinating afternoon at the Conservation Department of the Australian War memorial including viewing clothing fragments and other objects recovered from the recent WWI Fromelles excavations (http://www.army.gov.au/Our-work/Unrecovered-War-Casualties/Fromelles). However, the major reason I travelled to Canberra was to meet with Professor Robertson (University of

\(^1\) ESR are a major provider of forensic services to the New Zealand Police
Canberra) and Dr Hemmings (Australian Federal Police). We discussed a book chapter we have been working on together (although it was the first time I had actually met them), I attended a lecture and laboratory by Prof. Robertson, discussed forensic science training and opportunities with first year undergraduate candidates, attended an AFP ‘hair identification’ training course, gave an invited lecture at AFP, met with the AFP Textile Damage team and learnt about their procedures and discussed our planned collaboration on damage to underwear during alleged sexual assaults.

Paul and I with *Winston Churchill* by Ante Dabro (2001)

Recovered sock from Fromelles

Guest lecture at AFP

Dr Jane Hemmings, Professor James Robertson and I

**Melbourne**

In Melbourne I had two defence orientated visits at DSTO and Diggerworks. I presented my work to both organisations, learnt how the Australians forensically investigate combat damage to body armour and helmets and toured both facilities; potential future joint research projects were discussed. I also visited the Textiles Department at RMIT. I’ve known Mac Fergusson for a few years having met him at The Textiles Institute conference in 2010. Mac has worked with AFP on textile damage projects and is also involved in the book edited by James and Jane. He is supervising a PhD candidate Libby, who we hope will come to Shrivenham to spend some time working with us on a very interesting forensics project. I
had an opportunity to present to staff and students from RMIT with some outside guests from DSTO and CSIRO.

There were two highlights of my week in Melbourne, a visit to the Mortuary Team at the Victorian Institute of Forensic Medicine and dinner with Melbourne based WCMT Fellows. At VIFM I was invited to give a guest lecture and had a tour of the mortuary including learning how clothing is handled and packaged from a mortuary perspective.

With the Mortuary Team at VIFM

Melbourne Fellows, Lou Chamberlin (L) and Janine Barrand (R). Picture by Shane Ringin.

Dunedin

I worked in the Clothing and Textile Sciences Department (CLTE) at The University of Otago in Dunedin from 2001 – 2009; it was great to be back in the city. The primary aim of my time in Dunedin was to conduct scanning electron microscopy analysis with Liz Girvan on specimens from the two main research projects for my Fellowship i) laboratory recreation of damaged underwear and ii) apparel fabrics damaged by bullets. I and my co-authors are currently writing journal articles based on these two pieces of research. Whilst in Dunedin I gave an invited lecture to the Forensic Biology Group based in the Sir John Walsh Research Institute (SJWRI) and met the Director Professor Kieser and post-graduate candidates from CLTE and SJWRI. Prof. Kieser and I hope one of the PhD candidates will conduct some of her research at Shrivenham during 2013.
Liz Girvan (R) and I investigating damaged fabrics using the SEM

Damage to denim by a 9 mm x 19 mm FMJ bullet

Investigating seam damage in knickers

Therese de Castro (M) and Prof. Kieser (R) after my guest lecture to the Forensic Biology Group

Christchurch

The final visit of my Fellowship was to Dr Taylor at ESR and Dr Jermy at the University of Canterbury (UC). I gave a lecture at UC and we discussed current PhD projects at Canterbury and potential collaboration in the future.

Dissemination

Dissemination activities are on-going and include my blog and facebook pages, articles on various organisations web pages, invited lectures given during my Fellowship, reports in magazines, invited lectures after my Fellowship and academic journal articles.

- Forensic textile science blog
  http://www.forensictextilescience.blogspot.co.uk [accessed 19 December 2012]
- The Otago Centre for Electron Microscopy (NZ)
  (http://ocem.otago.ac.nz/news.html [accessed 19 December 2012] and
  [accessed 19 December 2012]
- The Sir John Walsh Research Institute (NZ)
- Lectures during my Fellowship at:
  Conservation Department Australian War Memorial, 10 September
  Australian Federal Police, 14 September
  DSTO, 17 September
Victorian Institute of Forensic Medicine, 18 September
Diggerworks, 19 September
RMIT, 20 September
Forensic Biology Group, University of Otago, 3 October
Department of Engineering, University of Canterbury, 12 October

- Article in Perspectives, the in-house staff magazine of Cranfield University (UK).
- An article is in preparation for Materials World, which is the in-house magazine of The Institute of Materials, Minerals and Mining (IOM3).
- Guest lecture to the Department of Engineering at The University of Leicester (12 December 2012)
- Guest lecture to the Cranfield Forensic Institute, Cranfield University (22 January 2013)
- Guest lecture to the School of Chemical Engineering, University of Birmingham (where I studied for my PhD) (21 March 2013)
- Guest lecture to my local Fellows Association (date to be confirmed)
- Two articles are in preparation for publication in academic journals i) laboratory recreation of damage to underwear during alleged sexual assaults and ii) gunshot damage to apparel and underlying bony structures. Submission is planned for both before the end of February 2013.