THE WINSTON CHURCHILL MEMORIAL TRUST OF AUSTRALIA

JENNIE NELSON

2008 Churchill Fellow

To study technical aspects of Forensic Science education
in the UK and Canada

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Introduction and Acknowledgements

This report details the findings of a 2008 Churchill Fellowship study tour to Canada and the United Kingdom to examine current practices in Forensic Science, with particular reference to technical aspects of education programs in tertiary teaching institutions. Also examined were some areas of early career professional development for newly appointed forensic practitioners. The study was carried out in June/July 2009.

Of special interest was the need for skill development to enable new graduates to operate efficiently within a variety of potential career choice areas initially, whilst allowing the maximum knowledge and flexibility to develop industry or employee specific skills and/or roles. The study examined the roles of both Forensic Science educational institutions, as well as a number of Forensic Science practitioner organisations and the roles played by both in the development of quality practitioners in this rapidly burgeoning field worldwide.

It examined some of the lessons learnt, particularly in the UK, where Forensics has been literally ‘under the microscope’ for the past decade, as the number of universities offering so-called Forensic Science degrees has skyrocketed and where Forensics has been the subject of numerous enquiries and parliamentary debate. As with many things in life, it is important to attempt to learn from the lessons of others and to attempt to put into practice those aspects that are appropriate to a local context.

This study would not have been possible without the generous support and assistance of many people within many organisations, at home and abroad. These include the staff and postgraduates students of the following universities and professional forensic science practitioners: School of Conservation Sciences, University of Bournemouth; Specialist Crime Directorate, London Metropolitan Police Forensic Group, New Scotland Yard; School of Forensic and Investigative Sciences, University of Central Lancashire; Centre for Forensic Investigation, University of Teesside; National Policing Improvement Agency, Co. Durham; The Forensic Science Service, Wetherby; School of Contemporary Sciences Forensic Sciences Program, University of Abertay, Dundee; Centre for Forensic Sciences, University of Strathclyde, Glasgow; Forensic Science and Identification Services, Royal Canadian Mounted Police, Ottawa; CBRN Forensics/CRTI Group, National Services & Research Branch, Royal Canadian Mounted Police, Ottawa; Biology Department & Forensic Science Program, Trent University, Peterborough and the Forensic Science Program, University of Toronto.

I would also like to take this opportunity to thank the staff and committees of the Winston Churchill Memorial Trust of Australia for the amazing opportunities offered by these Fellowships for all Australians. Everyone speaks of it as a ‘life-changing opportunity’ but even those words cannot do full justice to the voyage of discovery for each individual.
My referees, Dr James Robertson, National Manager and Head of the forensic group with the Australian Federal Police (AFP) and Ms Rhonda Hawkins, Deputy Vice Chancellor, University of Western Sydney, were also incredibly supportive of all aspects of my application and shared my delight when the Fellowship was supported. That support is acknowledged with many thanks.

Finally, I could not have even contemplated this journey of the last 18 months without the unswerving support of my family and friends, who all believed unequivocally from the very first moment, that I would not only be successful in achieving the Fellowship, but that I really could carry out this phenomenal moment in my life with aplomb and carry myself around the world in 61 days. So to each and every one of them, particularly Barry, Scott, Michelle, Swan, Karren, Sarah and Vince for that belief, my heartfelt thanks for sharing the journey, even if I left you at home.
Executive Summary

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Project Description: This report details the findings of a 2008 Churchill Fellowship study tour to Canada and the United Kingdom to examine current practices in Forensic Science, with particular reference to technical aspects of education programs in tertiary teaching institutions. Also examined were some areas of early career professional development for newly appointed forensic practitioners. The study was carried out in June/July 2009.

Highlights of Study Tour:
- Visiting police sector organisations in the UK and Canada and witnessing first hand university forensic science graduates working in their chosen fields as competent professionals.
- Visiting a variety of universities with forensic science programs at differing stages of development; discussing and observing their growth and techniques; and
- The amazing generosity of spirit exhibited by every organisation and individual staff member and student along the path; who all took the time to tell me about their own passions for this exciting science discipline and profession.

Major Lessons Learnt:
- The number of courses/providers within Australia needs to be monitored to ensure quality of providers, rather than quantity.
- The strengths of individual universities should be developed working to the strengths of the staff and faculties.
- Quality forensic science graduates must attain a thorough grounding in the traditional sciences in addition to the forensic sciences.
- All aspects of tertiary programs must be referenced to professional practice.
- Graduates must be exposed to a rigorous research culture.
- The forensic professional community should be encouraged and supported as partners in forensic education, including through joint research and development.
- Universities need to make a long-term investment to ensure that facilities and technology remains abreast of industry in this rapidly developing sector.

Dissemination and Implementation of this Report:
The information contained in this fellowship report will be communicated to key stakeholders in the forensic science education sector, including the national peak body (NIFS). Additionally, active dissemination through engaged provision via conference and fora presentations will be undertaken to begin the process of supporting the implementation of these recommendations.
Program

• June 8-14, 2009: Bournemouth, UK
  o Mass Grave Excavation Course, School of Conservation Sciences, University of Bournemouth (Privately funded)

• June 15-21, 2009: London, UK
  o Specialist Crime Directorate, London Metropolitan Police Forensic Group, New Scotland Yard
  o Metropolitan Police Service, Specialist Evidence Recovery and Imaging Service, Amelia Street, London

• June 22-28, 2009: Preston, UK
  o School of Forensic and Investigative Sciences, University of Central Lancashire

• June 29-July 4, 2009: Middlesbrough, UK
  o Centre for Forensic Investigation, University of Teesside
  o National Policing Improvement Agency, Co. Durham
  o The Forensic Science Service (FSS), Wetherby

• July 5-11, 2009: Scotland, UK
  o School of Contemporary Sciences Forensic Sciences Program, Abertay University, Dundee
  o Centre for Forensic Sciences, University of Strathclyde, Glasgow

• July 12-18, 2009: Ottawa, Canada
  o Forensic Science and Identification Services, Royal Canadian Mounted Police
  o CBRN Forensics/CRTI Group, National Services & Research Branch, Royal Canadian Mounted Police

• July 19-26, 2009: Toronto, Canada
  o Biology Department & Forensic Science Program, Trent University, Peterborough
  o Forensic Science Program, University of Toronto
**Week 1**: Mass Grave Excavation Course, School of Conservation Sciences, University of Bournemouth

This privately funded start to the Fellowship was undertaken as it provided an opportunity, unavailable in Australia, to learn from staff involved in forensic mass grave excavation in a professional context on a regular basis. Many of the academic staff members at the University of Bournemouth have on-going involvement with a number of international organisations investigating human atrocities across the globe.

Course leader, Dr Ian Hanson, Senior Lecturer in Forensic Archaeology, has worked with the International Criminal Tribunal for the former Yugoslavia as well as Bosnia, Croatia, Guatemala, DR Congo, Cyprus and Iraq. He now spends much of the non-teaching periods each year heading forensic archaeology teams for the International Commission for Missing Persons (ICMP) in Basra and Baghdad. In addition to the actual field work, Dr Hanson has also been involved in the development of international Standard Operating Procedures (SOP’s) for the location, evaluation, excavation, recovery, and recording of mass graves and the analysis of human remains and other evidence, in order to establish the identity of victims and the cause and manner of their deaths.¹

The School of Conservation Sciences, University of Bournemouth, runs a number of specialist short courses each year in Forensic Sciences for forensic practitioners and postgraduate students. This year’s mass grave excavation course was attended by forensic professionals and postgraduate students from 6 continents. After a series of theory lectures, the field work was carried out over 5 long days in Holton Heath, approximately 12 miles west of Bournemouth.

At this site, a suspected mass grave dumping site had been ‘discovered’, after reports of on-going genocidal attacks by pro-independence insurgents from a neighboring county. The role of participants was to establish a crime scene perimeter and investigate the site to determine whether the reports were correct and to retrieve and record all evidence and bodies for potential future enquiry by human rights investigators. All aspects of the field work were carried out using established international protocols and we were required to be on duty from arrival to departure, following all standard protocols including site inductions and emergency evacuation drills.

Figure 1: Excavations on Holton Heath 2009

Figure 2: Media report on Holton Heath excavations

The course was a wonderful opportunity to learn modern standard methods from professional archaeologists and anthropologists who work in these areas of forensic science on a regular basis. The importance of this type of work has implications not only for investigators of human rights violations worldwide, but sadly also for more local forensic professionals, including those working with policing bodies. The importance of correct retrieval methodology for bodies and associated evidence from murder or other unnatural death sites cannot be overestimated to ensure effective and sound outcomes at resultant trials.

Week 2: **London Metropolitan Police Service (MPS):** Specialist Crime Directorate and Specialist Evidence Recovery and Imaging Service (SERIS)

This visit was essentially a visit in two parts. The first to the Specialist Crime Directorate was to meet with Mr. Gary Pugh, (Director of Forensic Services) and his staff at New Scotland Yard in the fingerprint area. These highly skilled civilian staff members undertake all processing of fingerprint evidence, including matching recovered prints to coded and scanned prints through the Automatic Fingerprint Recognition (AFR) System. Senior staff members follow this evidence through to final preparation of court posters for presentation at trial to ensure jurors are able to fully comprehend the evidence and the spatial connection in time and space to the alleged crime. Staff members have also been heavily involved in Disaster Victim Identification (DVI) work during events including the London terrorist bombing (July 2005) and the 2004 Asian tsunami.

The Fingerprint Branch at New Scotland Yard, which started with just three people in 1901, has expanded rapidly over the years and the present Identification Service is now provided by a staff of 600 technical and administrative officers. Today, there are two Fingerprint Bureaux at New Scotland Yard, i.e. the National Fingerprint Office (which together with the National Criminal Record Office forms the National Identification Bureau) and the Metropolitan Police Scenes of Crime Branch, which incorporates the Fingerprint, Photographic and Scenes of Crime Examination Services.
Senior management in this section spoke of their quite revolutionary recruitment processes for civilian staff to work in the fingerprint section. Here new staff members are selected, not only on the basis of post-secondary or tertiary qualifications, but rather after a series of careful screening tests to determine individual pattern recognition aptitude. They believe that given appropriate training an individual with innate pattern recognition capability can attain a professional level of proficiency, including expert status, regardless of academic background.

This type of recruitment is seen as essential, even with the increased computerisation of fingerprint interpretation across the world, through the use of AFR, AFIS, SAGEM and other computer assisted programs. AFR was introduced to New Scotland Yard in 1984 and some staff were initially understandably threatened by that introduction. Today, the skills needed to successfully develop and test methodology to maximise outcomes from the technology are recognised to require effectively trained and skilled staff. In addition to current casework, staff are involved in screening of prints from otherwise ‘cold cases’ with this automated technique.

At present technical training for staff, such as Assistant Forensic Practitioners, Photographic Officers and Fingerprint Examiners, is conducted by forensic specialist trainers at the Crime Academy. The Metropolitan Police have recently entered into an agreement with the University of Teesside, Middlesbrough for the joint provision of educational training for forensic services staff. It is hoped that this Agreement will assist the Police Service to provide university accredited training for all staff. Both parties also believe that this Agreement will contribute to joint participation in research projects in forensic science and associated techniques.

The second part to this visit involved a visit to the laboratory facilities of the Specialist Evidence Recovery and Imaging Service in Amelia Street. Here the attitude to recruitment was noticeably different from that detailed above. Here it was made patently clear that all new recruits in this area of forensics at the Metropolitan Police will be degree qualified as a minimum requirement.
It is believed that the knowledge of scientific principles and methodology is needed from the very beginning of workplace training in the specifics of the individual’s role in the organisation.

The Specialist Evidence Recovery Imaging Services (SERIS) unit is responsible for all photographic requests and subsequent deployment of staff to all major crime scenes, terrorist events, public order and CBRN (Chemical, Biological, Radiological, and Nuclear) incidents under the direction of the MPS.

Of particular personal interest was the system used to ensure image integrity in such a vital part of the forensic ‘machine’. The system employed here has been developed in conjunction with a private company called West Point. It involves a multi-faceted system of duplication and back-up of every photographic image, both on- and off-site to ensure that the integrity of every image is unable to be questioned at any stage of the legal process.

Also on this site, staff from the Evidence Recovery Unit undertakes chemical treatment of evidence exhibits prior to fingerprint examination, DNA and firearms examination and use of specialised photographic lighting techniques. Management in these areas were particularly vocal about the need for university education for recruits to these roles, backed by job-specific training delivered in-house or in conjunction with a tertiary provider.

**Week 3: University of Central Lancashire (UCLan): School of Forensic and Investigative Sciences**

The University of Central Lancaster (UCLan) has a particularly large School of Forensic and Investigative Sciences, built upon a number of successive reorganisations of former Schools. Hence, it now provides a very diverse range of programs, including forensic investigation; policing and criminal investigation; fire and explosion studies; chemistry, including forensic chemistry; forensic biology; molecular biology; anthropology and
archaeology. Current student enrolments for the School are approximately 1400 with a staff of approximately 70 offering 15 different programs across both undergraduate and postgraduate levels.

Staff members at UCLan, as in many of the other universities visited, were quite open about the marketability of forensics in the university sector. In fact, they all mistakenly referred to it as the ‘CSI Factor’ of marketing. Young, and sometimes not-so-young students, are attracted to forensics by the modern, often unrealistic television shows they see and feel it is a very attractive career choice. UCLan had discontinued their chemistry degree and closed their Chemistry department in the 1990’s, but with expanded chemistry provision to support forensic science, were able to re-launch the course in 2006/2007. Did they feel this was a little unethical? No, anything that attracts students to study a science-based course is fair game and that includes forensics!

British universities offering forensic science courses invariably have extremely well-developed, and often state of the art, teaching facilities, including crime scene laboratories, simulated crime scene houses, specialist vehicle investigation areas, moot court rooms, police base rooms and forensic anthropology laboratories. UCLan was no different in this regard and their crime scene houses were particularly impressive, having been developed over a period of time to enhance the changing courses.

Three adjacent terrace houses, formerly student accommodation, have been acquired and developed for student class and assessment work. The lower floor of each has been designed to reflect a particular type of domestic dwelling: young family, student accommodation and elderly couple. On the upper levels, staff members have established permanent scenarios including a public bar and post office, as well as a specialist blood-spatter room in a renovated bathroom and an arson scene. These scenarios allow students to learn the skills required to work within scenarios accurately reflecting the content of a real-life established crime scene.

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3 House of Commons Science and Technology Committee (2004-05) *Forensic Science on Trial* Seventh Report of Session 2004-05
Figure 3: Simulated student accommodation scenario, UCLan

Figure 4: Commercial premises scenarios - Public bar (L) and Post Office (R)
A further initiative of staff at UCLan in the disciplines of forensic science and anthropology/archaeology is the development of a research centre called TRACES (Taphonic Research in Anthropology: Centre for Experimental Studies). This research facility was established and opened in 2009 on 13 acres of land and associated facilities in the northwest of England. TRACES staff are currently conducting experiments in all aspects of decomposition, trauma, forensic entomology, and forensic DNA using animal models. The extension of this facility to include research on human models is a future plan for UCLan but is currently limited by the UK *Human Tissue Act (2004)*.4

Figure 5: (L) Students working at TRACES site and (R) surface decomposition trial of an incinerated pig carcass detailing netting to protect from local animal scavengers (Photos courtesy of UCLan)

Another well developed aspect of forensic science education and research at UCLan is the area of non-human forensics in the form of wildlife forensics and conservation genetics. The University currently offers a Masters program in Forensic and Conservation Genetics and staff in this course apply molecular genetic techniques to both wild and captive populations of animals in order to understand their evolutionary history and population genetics, and to inform captive genetic management.

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4 *Human Tissue Act (2004)* UK
**Week 4: Middlesbrough, UK:** Centre for Forensic Investigation, University of Teesside; National Policing Improvement Agency, Co. Durham and the Forensic Science Service (FSS), Wetherby

**University of Teesside, Middlesbrough**

The University of Teesside is another of the relative newer British players in the forensic science education stakes but with an impressive list of continuing partnerships with domestic policing organisations; including most recently, the Metropolitan Police and the Defense College of Policing and Guarding, as well as international collaborations with the Norwegian Police University College and the Rwandan National Police.

With a number of undergraduate programs and an expanding range of specialist postgraduate courses in areas as diverse as digital forensics; collision investigation; mass fatality investigation and victim identification and forensic simulation and reconstruction, the range of options here for students are enormous and involve considerable cross-discipline collaboration between academic faculties.

Particularly interesting was the integrated approach to policing studies with students in the Foundation Degrees in Police Studies/Professional Policing programs confirmed as police constables with West Mercia Constabulary before the course begins. They then combine block release studies at Teesside with competencies attained through work-based learning. The first year of the course is centered on the Teesside campus, with students attending lectures and practical training, whilst undertaking regular rostered shifts policing the campus with experienced police officers.

Teesside also offers an undergraduate specialist degree in Digital Forensics, incorporating and combining computer science with crime scene techniques to extract knowledge of a digital artifact or piece of equipment. This interesting discipline can include, but is not limited to, a study of computer operating systems, mobile telephones, GPS systems, electronic documents and images etc. With the increase in terrorist activity
worldwide, this type of study and associated research is considered essential for international security.

The educational facilities on campus are extraordinary and include a fully functional police station with interview rooms and a mock court room, which is an exact replica of one of the courtrooms from the Teesside Combined Court and has been used at times of particular case overload for sitting magistrates. The facility also allows proceedings to be transmitted via the web enabling Q & A sessions via video conferencing.

Figure 6: Moot Court room facilities at the University of Teesside

In addition to these facilities, Teesside offers the largest crime scene house in any British university. The facility contains over 30 crime scene areas, including both domestic and commercial scenarios, including a travel agent, clothing store and bar as well as a specialised arson scenario room. The facility also has the capacity to extend the scenarios beyond the confines of the building to include simulation of outdoor scenes in a rear yard and grassed area. The building includes a fully-equipped briefing room with teaching aids including closed circuit television enabling staff and students to observe and record work in progress within the facility. In addition to forensics and policing students, the crime scene house is also utilised extensively for students in occupational therapy, consumer law and other related programs.
Teesside also has a fully operational vehicle examination laboratory, generally housing 10 complete vehicles, used by students to develop skills associated with processing a volume crime scene other than a building. These skills include photographic, evidence collection and fingerprinting.

![Figure 7: Students working in the Vehicle Examination Laboratory at University of Teesside](image)

**National Police Improvement Agency (NPIA), Harperley Hall, Co. Durham**

The NPIA began operation in April 2007, taking control from several previous precursor organisations, with responsibility for supporting police by providing expertise in such areas as information technology, information sharing, training and recruitment. It has responsibility for police forces in England and Wales but not the eight forces in Scotland.

There are currently four key locations in the UK where NPIA conduct specialist training in particular aspects of policing. These are in Wiltshire, Bedfordshire, Bramshill and Crook, near Co. Durham. It is at the last location, specifically at Harperley Hall, that the forensic science and crime scene training occurs for officers from domestic and international policing agencies.

Recent renovations, at a cost in excess of £10 million, have provided world-class facilities including 10 new classrooms, specialised fingerprint training suites incorporating Ident1 and Livescan and an impressive crime scene simulation training
block that features a realistic street scene with shops, roads and vehicles, plus 12 room settings that allow identical assessment scenarios for course participants.

Courses taught at Harperley Hall include a new modular Crime Scene Investigation course, undertaken as 4-5 week residential blocks integrated with workplace assessment and mentoring. This course has been accredited by University of Teesside as a Foundation Degree in Crime Scene Investigation, allowing officers the potential opportunity for future articulation to a full degree.

Rather than stand alone short courses, NPIA aims to deliver integrated ‘programs’ of study progressing from introductory through advanced units and associated refresher courses to ensure the currency of knowledge and skills match the requirements of policing bodies across the country.

This has come about as a direct result of the Strategic Framework for Forensic Science (SF4FS), developed in 2006 by a jointly sponsored project team drawn from the Association of Chief Police Officers, APA and the Home Office. At the request of the sponsors, the SF4FS was adopted by the NPIA and formally commissioned on 28 February 2008. Now renamed as the Forensics21 Program it aims to challenge, enable and improve forensic services to deliver an effective police-led forensic service fit for the 21st Century.
Also part of the Forensics21 mandate is the Forensic Science Competence Project. This aims to improve forensic skills and knowledge for all police officers, forensic practitioners, and other relevant staff, ensuring the effective use of forensic science in the investigation of crime across England and Wales. The teaching staff members at Harperley Hall are all former forensic science practitioners with extensive field-based practical knowledge of forensics at the grass-root level. The quality of that teaching is demonstrated by the fact that in 2009, thirteen foreign countries are utilising the services provided by NPIA for their own training needs.

**Forensic Science Service (FSS), Wetherby, York**

Just prior to this visit, extensive reorganisation of FSS was announced, including the closure of several UK sites and potential redundancies and/or redeployment of a substantial proportion of the workforce to the remaining locations. Prior to the reorganisation, FSS employed approximately 1900 staff across England and Wales. For years the government-owned operation enjoyed a virtual monopoly, providing analysis and interpretation of all forensic evidence to the police but the market was opened up to make the provision of those services competitive after a government review in 2003. This service extends from crime scene to court room, covering approximately 120,000 cases annually (2007).\(^5\)

FSS has led the development of forensic science technologies in the UK particularly in the following areas:

- FSS were instrumental in the development and implementation of DNA technology in the UK and also helped to pave the way for the establishment of the world’s first DNA database (1995);
- Introduction of the UK’s National Firearms Forensic Database (2003);
- Introduction of the Footwear Intelligence Technology (FIT), the UK’s first online footwear coding and detection management system (2007).

\(^5\) [www.forensic.gov.uk](http://www.forensic.gov.uk)
Predictably for a commercial organisation, FSS is extremely well equipped with forensic analytical technology and equipment. Staff members have a well developed program of in-house training and mentoring to ensure that new recruits are competent to use all equipment in their particular discipline. This competency is then maintained via periodic refresher training. Each discipline has a team leader/trainer, responsible for the delivery of small group training sessions, which are benchmarked and consistent across all sites to provide transportable levels of knowledge and skills within the organisation.

New recruits are provided training in the area within which they will work, i.e. biology, chemistry, trace evidence, etc and are then mentored to attain requisite levels of competency, before being able to carry out particular analyses. This mentored competency-based approach is monitored by senior staff to ensure recruits are making appropriate progress before progressing to more advanced techniques.

**Week 5: Scotland, UK:** School of Contemporary Sciences Forensic Sciences Program, Abertay University, Dundee and Centre for Forensic Sciences, University of Strathclyde, Glasgow

**Abertay University, Dundee**

Abertay University is a relatively new university in eastern Scotland, attaining that status in 1994, after a history as a technical institute since 1888. Forensic science has been part of the university prospectus for only seven years. Currently the university offers only a 4-year BSc (Hons) degree in Forensic Science, but a Masters Degree in Forensic Biology has been suggested for the future. It is also possible to exit the 4-year course after two years with a Diploma of Higher Education.

Abertay was awarded accreditation by the UK Forensic Science Society in October 2008 for its degree program across all three elements (Crime Scene Investigation; Interpretation, Evaluation and Presentation of Evidence and Laboratory Analysis). This was in addition to receiving six commendations for particular aspects of their course
including the scenes of crime facilities and equipment; high content of the practical courses; level of academic expertise within the department and the establishment of close links with the Scottish forensic laboratories, Tayside and Fife Constabularies. The program is also recognised by the Royal Society of Chemistry for membership of graduates.

Abertay have a unique simulated crime scene facility in the form of a complete Bank of Scotland bank transplanted to the city campus. This facility, opened in January 2009, allows staff to establish a complex and multi-level assessment armed robbery scenario for final year Honours students, which takes a full day to complete. The Bank of Scotland donated and transported surplus bank furniture, fittings and advertising material from branches recently closed in nearby Leith and the entire scene was rebuilt by Abertay tradesmen including counters and bulletproof screen.

![Figure 9: Abertay University ‘branch’ of the Bank of Scotland (2009)](image)

Abertay University is embracing new technologies and inter-departmental collaboration with the establishment of new and innovative White-Space facility, where students, lecturers and industry professionals work side-by-side in an open-plan learning environment to work within, across and between disciplines. Whilst this facility was established initially for students and staff in the revolutionary computer games technology, forensics staff members are considering ways to integrate this technology into the forensics education arena.
One example of this future collaboration being investigated is the use of the Human Interactive Virtual Environment (HIVE). This is a multi-purpose space with TV studio, film and digital image realisation capabilities, home to cutting edge total immersion video environment for interaction with virtual environments, including 3D stereo vision and surround sound. It also offers walk and grab capabilities, one person recordable head tracker, and the potential to project a live object into a virtual background. Already used for police training, the possible next step is to integrate forensic scenes of crime assessment into the possible scenarios.

University of Strathclyde, Glasgow

Unlike any other UK university this Glasgow institution has been providing postgraduate education courses in the forensic sciences for over forty years. The centre for Forensic Sciences is an internationally recognised Centre of Excellence in teaching, research and casework and has provided training in forensic science to police, scientists and lawyers from over 35 countries.

Staff at Strathclyde make no apologies for the fact that they believe that there are far too many ‘players’ dabbling in the provision of forensic science education. Many were prepared to be quoted that they believe forensics should only be taught at the postgraduate level after a thoroughly grounded undergraduate degree in sciences.

Hence, whilst Strathclyde offers an undergraduate program, it is a four-year MChem (Hons) Forensic and Analytical Chemistry, fully accredited by both the Royal Society of Chemistry and the Forensic Science Society. This course follows the same basic structure as the MChem (Hons) Chemistry degree, with "core" content augmented by courses in Forensic and Analytical Chemistry. Students can then choose to progress to an MSc Forensic Science or an MSc in Forensic Informatics.
Staff at Strathclyde also have an impressive research and casework record, having published in excess of 100 peer-reviewed papers in the past 10 years, as well as providing expert advice and opinion on many high profile forensic cases. They have also authored 19 book chapters and patented a number of technological developments of relevance to the field of forensic sciences.

**Week 6: Ottawa, Canada:** Forensic Science and Identification Services (FS&IS), Royal Canadian Mounted Police (RCMP) and CBRN Forensics/CRTI Group, National Services & Research Branch, RCMP

The visit to the RCMP forensic complex in Ottawa was impressive for the range of forensic technology present in one site. It is part of the largest of six laboratories operated by the RCMP across Canada, housing more than 700 employees. Services provided from this site include evidence recovery; analytical biology; biology reporting; expert testimony; the Canadian National DNA Data Bank; Scientific Service Branch and the Integrated Ballistics Identification System/Canadian Integrated Ballistics Identification Network (IBIS/CIBIN).

Particularly impressive were the fully automated DNA analysis suites within the Biology Services Directorate, which provides biological evidence recovery, DNA analysis via PCR amplification and reporting through the Crime Scene Index of the National DNA Data Bank of Canada.

An intriguing technology currently being developed within a super-secure area of the Ottawa site is a technique to ‘fingerprint’ rough and polished diamonds to identify country and even possibly mine of origin, to prevent substitution of inferior stones for more valuable gem-quality ones. The technique involves the use of laser ablation inductively coupled plasma mass spectroscopy (LAICPMS) to measure and identify trace impurity elements within each stone, providing a fingerprint of the particular stone. This profile can then be compared against a data base to determine point of origin, in a similar way to the use of genetic fingerprinting.
The RCMP scientists are in the process of developing the data base for the work, as without a reliable reference data base, the analysis is meaningless. This is steadily becoming a reality through collaboration with diamond dealers HRD in Antwerp and De Beers in London.

The RCMP has recently entered into negotiations with Trent University in Peterborough for the training of its forensics staff through their degree program. Trent University was visited the following week and their program will be discussed further.

Several RCMP forensic staff members interviewed expressed concern at a push to ‘civilianise’ the provision of at least some volume crime scene services. This move has included the employment of civilian forensic identification assistants in large city centres to help with the backlog of analyses required. RCMP officers believe this will be the beginning of a move to expand the civilian staff further; a situation they believe is unworkable due to the unique physical conditions within Canada. Their concerns include the fact that officers working in small isolated communities are often required to secure volatile scenes and/or communities where crimes have occurred before attending to normal evidence retrieval and this cannot be done safely by unarmed civilian staff with no authority to arrest or detain.

The work of the CBRN Forensics/CRTI Group, National Services & Research Branch was discussed with Program Manager, Dr Denis Nelson during this visit. His very small group of staff members is coordinating research into a number of collaborative projects in the areas of biological, chemical and radiological security. This group, operating since 2002, began initially as a five year program to provide research into extending Canada’s capacity to deal with potential chemical, biological, radiological-nuclear and explosives (CBRNE) threats to public security. That five year agenda was extended in late 2006.

The 2009 annual Public Security Summer Symposium was held in Ottawa in June, organised by the Defence Research and Development Canada-Centre for Security Science (DRDC CSS), which is a joint endeavour between the Department of National
Defence (DND) and Public Safety Canada. DRDC CSS’s principal *raison d’etre* is to enhance Canada’s ability to prevent, prepare for, respond to, and recover from high-consequence public safety and security events.

The range of projects funded by these organisations and discussed at the 2009 Symposium with forensics applications include, but are not limited to:

- Crime Scene Modeler (C2SM) and C2SM-FAST. The objective of this study is to develop a mobile robot capable of collecting evidence at crime scenes contaminated with chemical, biological, radiological or nuclear agents with minimum exposure to first responders;
- The development of a national Microbial Forensics Centre for Canada to develop Canada’s capacity for bio-crime attribution and robust bio-forensics capability to ensure Canada’s readiness in the event of a bio-crime event; and
- The Direct Alpha Spectrometry for Forensic Samples (DAAFS) project which plans to deliver a field-deployable alpha spectrometry system that will perform direct measurement of forensic samples for difficult to detect radioactive isotopes.

Each of the more than 50 projects is a collaborative effort, with a Project Lead Agency, as well as Federal and Industry Partners providing the joint expertise, skills and knowledge to make these projects reality.6

Of personal interest was the Higher Education Co-operative for Hazardous Materials and Equipment Tracking project, lead by the RCMP-National Services and Research Branch, with federal and industry partners, Royal Military College of Canada; Vertére Inventory Management Software; University of Ottawa; Queen’s University and Concordia University. This project is scheduled for completion in 2012.

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Week 7: **Toronto, Canada:** Biology Department & Forensic Science Program, Trent University, Peterborough and Forensic Science Program, University of Toronto

**Trent University, Peterborough**

As previously mentioned, Trent University has recently been selected by the RCMP as the educational provider for their forensic science staff. The forensics program at Trent was established in 2004 as a BScFS with particular emphasis on emerging technologies in DNA forensics and crime scene investigation. From 2009, Trent will be offering dual major honours degrees combining forensic science with a variety of other disciplines, not limited to science. The choices currently suggested by the departmental marketing include Psychology, Biology, Computing and Information Systems, Chemistry and Physics. Also suggested is a joint BA degree, combing forensics with Sociology or Political Science.

All undergraduate students at Trent undertake a field placement during the second year of their course. This practicum consists of 70 hours mentorship/work placement with a relevant employer, organised and monitored by the Forensics Placement Officer. The 70 hours are negotiable and flexible and can be completed in a block across non-teaching periods or can be accumulated across the entire year.

In early 2009, Trent opened its new Crime Scene House, a two-story farmhouse on campus, providing ongoing student learning opportunities across their four years of study.Whilst this type of facility is common in the UK, it appears less so in Canada, so this facility should position Trent well for student marketability, particularly in the crime scene investigation arena.
Trent University also has a substantial investment in the forensic science research arena with all teaching taking place in the aptly named DNA Building, which also houses the DNA and Forensic Science Centre. Hence students are immersed immediately in a research-driven fully functional research and service environment. This provides the students with an informed view and investment in areas of non-human forensics as diverse as wildlife genetics, domestic animal tracking, pathogen tracking and bioterrorism agents.

A major part of the non-human forensics work takes place in the Wildlife Forensic DNA Laboratory, which was relocated to Trent in 1997. This laboratory was responsible for the first DNA evidence involving a wildlife infraction to be accepted into a North American court in 1991. Since then the lab has processed over 750 forensic cases involving moose, white-tailed deer, black bear, wild turkey, walleye and rainbow trout.

**Toronto University, Mississauga (UTM)**

The UTM Forensic Science programs are also relatively new and consist of either a BSc with a double major similar to the Trent University model or a specialist program of study across the following disciplines: Forensic Science-Anthropology; Forensic Science-Biology; Forensic Science-Chemistry and Forensic Science-Psychology.
The current faculty members at UTM are severely limited by the teaching facilities available to them at present, particularly in crime scene investigation, but appear to provide a reasonably comprehensive level of training and student satisfaction is quite high. Undergraduate students interviewed acknowledged the diligence and professionalism of all staff but remarked that they would prefer greater access to more hands-on training during their course to prepare them for both their study internship and also to prepare them for the workforce.

In response to that critique, the staff members are conducting a two week Forensic Identification Field School this semester for the first time in addition to the timetabled formal weekly classes. The Field School, which will include an evening session to cover night time motor vehicle collision photography, will enable students to process mock crime scenarios in more thorough detail than the current sessions allow.

In addition, students in their final year of study prior to graduation may apply to undertake an internship, working with a forensic science organisation. This extremely well facilitated program provides the students with the opportunity to be involved in a research project or work part-time in a forensic unit or related facility.

Forensic organisations currently participating in the program include the Centre of Forensic Sciences, the Office of the Chief Coroner of Ontario, and a variety of local, provincial and national police and private agencies. Participating students are teamed with an appropriate expert in the field of interest. At the conclusion of the internship, students present a paper on their research outcomes to both faculty and forensics professionals from the supporting organisation during a Forensic Science Day on campus.
Staff at UTM interviewed during the visit believed that the cornerstones of their program, which have been critical to the current success of both the course and graduates include:

1. A solid basic science education—provided with much support from the traditional Departments at UTM;
2. Involvement of the forensic profession in teaching and the internship;
3. The internship program and Forensic Science Day;
4. High admissions standards for the Program;
5. Outstanding commitment and professionalism of all staff (academic and administrative) involved in the courses; and
6. Involvement of the UTM Student’s Society for ongoing support.
Conclusion:

The purpose of this 2008 Churchill Fellowship study tour to Canada and the United Kingdom was to examine current practices in Forensic Science, with particular reference to technical aspects of education programs in tertiary teaching institutions. The concept of benchmarking best practice within these educational institutions, whilst an attractive concept, was never going to be possible due to the peculiarities of individual countries and forensic practitioners/policing agencies. Hence, this section of the report will deal with the application of forensic science education and the lessons to be learnt to ensure that Australian education providers move forward in a positive fashion to better meet industry expectations.

The principal areas for discussion identified during this study were the increasing number of forensic courses; university staffing qualifications/experience; teaching facilities and response to industry and industry partnerships.

Forensic science education providers and course availability:

In 2004, within the UK, 57 universities were offering 401 degree courses in forensic science.\(^7\) This had increased to 60 in 2007/2008 and approximately 75 universities will offer forensic-based courses in 2009/2010.\(^8,9\) The offerings in 2004 were extremely varied and included Citizenship and Forensic Studies (London South Bank University); Forensic Science and Human Resource Management (Keele University) through to Football Technology and Forensic Computing (Staffordshire University), in addition to more traditional forensic science courses.

Within Australia, the number of educational providers is closer to 20, with the University of New England also entering the field in 2010 with a BSc (Forensic Science). The 2005

\(^7\) House of Commons Science and Technology Committee (2004-05) *Forensic Science on Trial* Seventh Report of Session 2004-05
\(^8\) [http://www.theyworkforyou.com/wrans/?id=2009-07-07b.283599.h](http://www.theyworkforyou.com/wrans/?id=2009-07-07b.283599.h)
\(^9\) [http://www.ucas.ac.uk/](http://www.ucas.ac.uk/)
UK report of the Science and Technology Committee expressed concern at the steadily increasing number of courses in the area as being non-representative of “the limited employment prospects in forensic science nor is it in response to employers in the sector”.10 The situation in the UK appears unchanged as staff at Universities report that students continue to enrol in the myriad of courses, even though advertising warns that completion of the courses in question will not guarantee employment within the industry.

Rather, staff counter with the fact that provided their courses provide a strong grounding in the analytical sciences, preferably with a research focus, graduates will be able to successfully attain employment within the science field, although admitting possibly not in forensic science, as the field is quite limited. There is no reason to doubt that in Australia, the potential exists for a similar situation to develop at some time in the future. It is therefore essential that tertiary forensic science graduates have a very strong grounding in the traditional science subjects as well as exposure to a research culture to make them strong, independent research scientists, capable of working across a wide variety of scientific disciplines.

Academics in both countries visited also spoke mistakenly of the ‘CSI factor’ in marketing their degrees to the general public. This is a reference to the popularity of certain television drama shows and novels, which depict an attractive but stylised version of crime scene investigation as a career. These marketing ‘tools’, along with media coverage of high profile criminal cases ‘solved’ by forensic scientists, no doubt contribute to the strong demand for forensic courses.

Of more concern, is the practice of re-badging failed or failing degrees, e.g. BSc(Chemistry) as ‘forensic science’ degrees to attract enrolments. Academics justify this by stating that anything that encourages students to reconsider the sciences as a career option is worthwhile. They often state the case of archaeology degrees in the UK,

offered by approximately 50 universities in 2010, with extremely limited employment prospects for graduates. The reasoning is that whilst it may be the thought of studying archaeology that encourages students to enrol in higher education, by completion of third or fourth year, they may be focused on other avenues and their degree will still be sufficient to allow them to move in that direction.

To address the burgeoning UK market in forensic science courses and make universities somewhat accountable for the quality of their offerings, the British Forensic Science Society has developed an accreditation program for forensic university courses. In 2004 only 24 universities were participating in the program, whilst the 2009 website lists only 14 accredited universities. Launched in 2009, is a newer collaboration between the Forensic Science Society and Skills for Justice to accredit forensic organisations and educational institutions offering forensic science. The newly badged ‘Forensic Skillsmark’ accreditation has been awarded to 25 education and training providers to date. Canadian universities interviewed expressed the view that Canadian accreditation will most likely follow USA Forensic Science Society guidelines in the near future. Currently, although discussed by peak bodies, including the Australian National Institute of Forensic Science (NIFS), there is no move for similar accreditation in Australia.

**Staffing qualifications/experience to meet industry standards:**

The often expressed concern, particularly among the more ‘traditional’ universities is to ensure that forensic science graduates receive the strongest grounding possible in the traditional analytical sciences. Strathclyde University senior academics went so far as to suggest that forensics should only be taught at post graduate level after completion of an undergraduate science degree.

11 www.ucas.ac.uk/
12 http://www.forensic-science-society.org.uk/
13 http://www.skillsmark.net/
However, with the strong continued growth in undergraduate offerings in forensic science, how do universities ensure that graduates are being trained to undertake not only the ‘pure science’ but also the more ‘applied’ aspects of forensics? Forensic practitioners interviewed, from both the policing field and also the forensic analysis arena, all stated that the best recruits are those who have a strong grounding in, and understanding of, the importance of evidence collection and management, from an early stage of their careers. Another professional practice discipline area of forensics cited as similarly important by many practitioners was applied forensic photography.

These skills and knowledge need to become second nature to forensic practitioners and the most logical way to encourage that is to ground all aspects of undergraduate study in the processes of forensic professional practice. One way to provide this is by the recruitment of staff from the forensic industry to support the criminalistics units within degrees. This is certainly the case in both countries visited, where staff seconded from the police sector, with extensive experience in crime scene investigation are employed to complement the existing staff within departments. This experience in the field, and the currency of that experience, was commented on many times by students in both countries as being an essential component of their time at University.

With universities becoming more and more research driven, there will be those who will argue that the potential for research output from these industry-based staff is lower than for other staff. However, in forensics this is not always true as these industry professionals are also often very active in casework and also have the potential to lead research into industry and technique-specific issues. Likewise, the capacity to team teach in units with strong vocational and research driven curricula is enhanced through the integration of industry and forensic sector leaders to complement the academic staff and is an attractive option which should be embraced.
Provision of teaching facilities within Universities:

In addition to providing staff with appropriate qualifications and current professional knowledge to lead these courses, part of the accreditation process in the UK is the examination of the capacity of the organisation to provide adequate facilities and technologies to provide graduates with the skills and knowledge required to work in the industry. This capacity includes both the provision of adequate physical infrastructure as well as access to current technologies where applicable to curriculum.

Professionals within the forensic fields in both countries spoke of the ‘desired’ capabilities of new graduates entering the sector with similar ideals. Whilst most provide internal initial induction courses and ongoing training for staff, new staff who have been exposed to quality facilities and ‘new-age’ technologies adapt quickly to the specific requirements of the industry.

Universities visited in both the UK and Canada have embraced this concept, with many providing state of the art crime scene simulation facilities; volume crime examination laboratories, incorporating vehicle examination capabilities and forensic identification laboratories with industry comparable technologies. This includes universities in the UK equipped with technologies such as Automatic Fingerprint Recognition (AFR) Systems similar to the Metropolitan Police and comparison microscopes through to Trent University in Canada with automated DNA recovery and analysis technology identical to that used by the Royal Canadian Mounted Police.

Particularly valuable for students in many of the universities visited, was the opportunity to participate in activities within a ‘moot court’. This integral part of many of the programs allows students to experience firsthand the adversarial system and the relationship between forensic science and the legal system.
Forensic education and industry partnerships:

All university forensic science programs visited participate in some form of external advisory committee process in an attempt to ensure that their program, and graduates, meets the expectation of the professional sector. Most committees meet on an annual cycle and included members of all representative bodies, including industry, academic management, undergraduate students and recent graduates. The importance of these committees cannot be overstated to ensure ongoing benchmarking of courses and programs against agreed indicators across a range of standards of practice.

The capacity of a university to develop partnerships within the sector can also benefit the university in a number of other ways. Many overseas universities include an internship within their undergraduate programs with extremely positive feedback from students on this aspect of their study. Likewise industry partnerships can allow for joint supervision with university staff of Honours or postgraduate student research in a number of areas including casework, further strengthening the research culture development.

Other areas of potential industry partnerships currently utilised successfully at several universities in the UK include technology partnerships with equipment companies, who provide pieces of equipment, e.g. microscopes or analytical instrumentation, to a university program for utilisation for a particular unit or project. The University has the chance to trial the equipment for a period of time, undertaking research and development, whilst the company provides the University as a reference to other potential buyers of the equipment. These type of mutually beneficial arrangements also have the potential to lead to the development of a number of scholarships for forensic programs.
Recommendations:

When the University of Western Sydney introduced its Forensic Science program in 2004, there were many naysayers, even amongst the academic staff within the School, who felt it would be a flash in the pan course. They expected high enrolments initially with steadily declining numbers over time and a flooded graduate market within a few years. One revelation of this study tour was that these people are undoubtedly wrong. Universities like Strathclyde in Glasgow are testament to that, continuing to thrive after more than 40 years of providing quality graduates to the world in the forensic sciences.

So what are the main lessons to be learnt from this? Simply put, they include the following:

1. The number of courses/providers within Australia needs to be monitored to ensure quality of providers, rather than quantity. Whether this will ultimately include accreditation of universities and/or courses remains to be seen.

2. The strengths of individual universities should be developed to ensure that universities do not become clones, offering the same basic courses. Instead universities should work to the strengths of the staff and faculties.

3. Quality forensic science graduates must attain a thorough grounding in the traditional sciences in addition to the forensic sciences.

4. All aspects of tertiary programs must be referenced to professional practice.

5. Graduates must be exposed to a strong research culture, more easily attained within faculties with an existing strong research focus among academic staff.

6. The involvement of the forensic professional community in forensic education, through a variety of avenues including advisory committees, joint research, joint teaching appointments, etc cannot be overstated.

7. Universities need to make a long-term investment to ensure that facilities and technology remains abreast of industry in this rapidly developing sector.
8. Joint research into new and rapidly evolving areas, e.g. digital forensics should be explored and developed for the future.

9. Further to this, investment in research and development of new crime scene and criminalistics methods, including a range of optical enhancement methods to replace chemical enhancement treatments in the future, should be explored through partnerships between practitioners and educators.