

Wavelength

Spring 2008

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This issue...

During 2007, as part of our evaluation of the Centre's publications, we surveyed our Departmental Representatives and the wider community and discovered that our attempts to create a uniform 'brand' design for all our publications had meant that it was not always easy for readers to tell one offering from another and also one issue within a series from another!

We decided that in order to rectify this we would redesign the covers of our publications and this is the first offering. Hopefully the continuing series of issues of our newsletter, *Wavelength*, will now be easily identifiable from one another and from our other publications.

Later this year our journal, *Physical Sciences Educational Reviews* will be re-launched with a new design and a new name, *Reviews*, and a new ISSN.

Similarly, Practice Guides will have new covers and each will be designed to be recognisably different to the other guides we produce.

New Directions, our other journal, is already designed to be distinguishable from our other publications and each issue has a different graphic on the cover.

This issue of our newsletter has a theme, *Forensic Science*. This reflects the decision taken recently by the Higher Education Academy that 'emerging disciplines' should be supported wherever possible by existing subject centres. As the Physical Sciences Centre had been supporting Forensic Science on an *ad hoc* basis since our inception (as part of the LTSN) in 2000 it was a natural progression to make that support 'official'. Note too that as a sign of this support we have incorporated 'Forensic Science' into our tag line that appears on all our publications and web site.

In this issue we have articles from a number of professional and academic forensic science practitioners and overviews from the Centre. ■

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Forensic science support from the Centre

The development of forensic science support from the Centre

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Background

In 2000 forensic science was a fledgling academic discipline, especially in comparison to 'our' other disciplines of chemistry, physics and astronomy. Forensic science has however grown rapidly. Some of the new provision has grown out of traditional departments such as chemistry and other new programmes have been established as new science provision within institutions without the analytical science tradition.

Many observers put the increased popularity of forensic science courses down to the steady increase in TV programmes about forensic science capturing the interests of young people. As a result there are now well over 300 courses offering forensic science in some form or another. There have been concerns from some, especially employers, that students have the mistaken assumption that a forensic science degree automatically qualifies graduates to work in the forensic science industry. However, a report jointly funded by HEFCE, the Centre and SEMTA (the Science, Engineering, Manufacturing and Technology Alliance Sector Skills Council) in 2004, titled *Forensic Science: Implications for Higher Education 2004* found that the 'new' forensic science students were 'new' to science and would not have otherwise been tempted to study a science. So the proliferation of forensic science courses is bringing in new undergraduates to study science, which must be good news for science as a whole.

Formal support from the centre

After the inception of the Centre in 2000 (then, as part of the Learning and Teaching Support Network), there was a slow but steady growth of interest in, and requests for help in supporting forensic science education. In the early days, forensic science educators looked to share resources and experiences with each other. This interest was supported by the Centre who ran several 'forensic science swapshops' to enable academics to meet and share experiences and resources for teaching forensic science.

Due to the expanding number of forensic science related courses, this interest soon grew beyond the confines of a one day swapshop. In 2005 the Centre collaborated with the Forensic Institute Research Network (FIRN) to run a formal forensic science teaching and research conference. The conference was held at the University of Lincoln and called the FORREST conference (FORnsic RESearch and Teaching).

As a consequence of these activities, the Centre was now regularly supporting the development of forensic science as a discipline in its own right but on an informal basis. This de facto support as part of our physical sciences remit has since been recognised. In December, our parent organisation, the Higher Education Academy officially recognised our work in this area and allowed us to formally add forensic science to our discipline remit. This was after consultation with colleagues in other cognate subject centres to ensure that there was no duplication of efforts.

Collaborative partners

The Centre's remit is to support the physical sciences community across all UK Higher Education Institutions. In relation to forensic science therefore, we aim to work with all interested bodies and organisations that represent the forensic science community. Examples of such bodies are FIRN (Forensic Institute Research Network), UKFSEG (UK Forensic Science Education Group), The Forensic Science Society and Skills for Justice – the Sector Skills Council which covers forensic science provision.

FIRN aims to promote good forensic science research in higher education and as part of its activities, it jointly organises the FORREST Conference with the Centre. Since the first conference in 2005, FORREST has become a successful annual event and this year the 4th conference which will be held at Robert Gordon University in Aberdeen on 1st-3rd July. Anyone interested in submitting contributions or who would like to attend the conference are more than welcome and can register online from our website.

UKFSEG is a group of HEIs involved in delivering forensic science courses and has membership from a range of employers and professional bodies. The Centre hosts a Special Interest Group (SIG) for any academic interested in forensic science and involvement with UKFSEG is possible via their involvement with the SIG. The SIG itself is run by the forensic science community, for the forensic science community. It has only been in operation for about one year but has already held a number of meetings and has several more planned for the coming year.

For more details of the Forensic Science SIG see back cover of this newsletter.

Forensic science support from the Centre

The Forensic Science Society (FSSoc) is a well established body which recently gained charitable status as a professional body to represent a range of people with an interest in forensic science. The Centre has started working closely with the FSSoc to explore ways of supporting forensic science. In a similar manner, the Centre is also developing links with the Sector Skills Council, Skills for Justice who have a remit to cover forensic science employers, to explore opportunities to promote the profession.

Growing resources

The Centre is always expanding the range of resources it has to offer the forensic science community. In addition to regular publications such as reviews of forensic science books, the Centre has produced a student employability guide to help students identify and make the most of the skills they develop on their courses. The Centre has funded several forensic science development projects, most recently a 'Forensic science casework teaching resource project' and has a national JISC (Joint Information Systems Committee) project to digitise some forensic archaeology resources from an archaeological dig.

For more details of the Centre's Forensic Science resources see pp14-15 of this newsletter.

Ongoing events

The Centre continues to support the work of its forensic science SIG and the meetings organised by the group. Anyone is welcome to get involved with the SIG and its work. There is a jointly organised event in March with The Forensic Science Society and UKSFEG entitled *Fostering collaboration between the forensic industry and academia* and, as already mentioned, our flagship annual FORREST Conference will be hosted in Scotland this year so we look forward to seeing you there. Finally, if there are other ways you would like to see the Centre support your work we are always happy to listen – and enlist your help of course! ■

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The Forensic Institute Research Network

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Allan Jamieson is the Director of The Forensic Institute and founder of the Forensic Institute Research Network (FIRN) as well as being a member of the editorial board of Clarke's Analysis of Drugs & Poisons, Co-Editor in Chief of Wiley's Encyclopaedia of Forensic Science, and providing court evidence including high profile cases. In addition to frequent media appearances and comment, he is external examiner for forensic sciences at Dundee University, and Herriot-Watt University.

Raul Sutton has been at the University of Wolverhampton for 20 years. In 2002 he introduced Forensic Science to the award portfolio at the University, subsequently becoming the Head of Forensic Science in 2005. The Wolverhampton degree courses have received accreditation from the Forensic Science Society. His current research includes the reliability of third level detail in fingerprint analysis and the use of fingerprints as tools for working conditions in the third world. He is currently on the Committee of the Fingerprint Society and the management Board of FIRN.

The burgeoning activity in forensic science in universities continues to attract criticism. A positive aspect is the potential to inject a much-needed boost to research in all forensic practices. Only recently has fingerprinting, for example, been exposed to rigorous scientific examination and, to a great extent, been found wanting as regards its science – probability apparently has no place in fingerprint examination.

In response to the opportunity The Forensic Institute brought together representatives from more than 40 UK universities to discuss how this new resource, academics and students, could be used to further research in the forensic sciences. It was envisaged that many casework-related problems, such as environmental frequencies of trace evidence, could be best accomplished by a lot of small student projects coordinated on a national and perhaps international level by a steering group. This steering group in turn would be part of an integrated research strategy developed in conjunction with practitioners. A virtuous cycle of practice, research, development, and practice would be the outcome. And so, in 2004, The Forensic Institute Research Network (FIRN) was born.

The FIRN Management Board has members representing all of the regions of the UK and some co-opted specialists. The main developments of FIRN were agreed to be;

1. The creation of an online Forum to stimulate discussion, collaboration, and knowledge transfer consistent with the aim of FIRN. Undoubtedly the Forum is not as active as was envisaged. Academic staff could encourage their students to raise and respond to questions in this and so develop a useful information resource.
2. The launch of an online, open access, peer-reviewed journal (www.theforensicinstitute.com/public_html/firmjournal.htm) with areas for refereed research papers, short technical reports, case histories, and letters. This project took a positive turn when the publisher, John Wiley, developed the concept, and the launch of a journal and website are due this year.
3. FORREST, the FORensic RESearch and Teaching conference (www.theforensicinstitute.com/public_html/forrest2005report.htm), the fourth FORREST Conference will be at Robert Gordon University, Aberdeen this year. A call for papers is current.

4. The creation of online databases for trace evidence prevalence to aid in operational work. The creation of the National Trace Evidence Database has been pioneered at Staffordshire University with fibres being the first evidence type to be entered. A large number of universities and students now contribute data to this excellent project.
5. The development of a comprehensive integrated research strategy for the evidential process. A sub-committee of the FIRN management board continues to develop this strategy. One outcome of this work is the bringing together of universities in collaborative projects that can obtain joint funding for projects. Funding applications will have greater strength in being part of a published and agreed strategy and in being joint activities between academe and industry. The Forensic Institute can be involved, or advise on, industrial partners.

All of these can be accessed via www.theforensicinstitute.com/public_html/firn.htm.

The HEA Physical Sciences Centre has promoted activities that allow the dissemination of knowledge on pedagogic innovation in this rapidly expanding field. It has supported organisations that promote this activity and the aims of FIRN fit comfortably into this (www.theforensicinstitute.com/public_html/firn.htm).

An important development since the original meeting has been the development of a regional structure and the involvement of the student body by the organisation of local student conferences. The regional structure facilitates many of the aims of the organisation by allowing each region to hold events.

To date we have:

- co-opted influential personnel from each region to champion FIRN within that region onto the Management Board of FIRN.
- enabled a greater diversity of student-led activities to operate under the auspices of FIRN. We have instituted regional student conferences to facilitate regular students meetings and allow greater opportunities for student presentations. The best students are invited to the FORREST conference, so that the national conference will showcase the best Forensic Science

The Forensic Institute Research Network

UK undergraduate students. FORREST will then be seen as a useful recruitment vehicle by employer organisations, which will in turn raise the profile of UK HEI forensic students with employers.

- The student conferences form the first strand in developing regular meetings between geographically located institutions. This will allow sharing of teaching expertise across institutions, thus facilitating the production of research during sabbatical breaks for example. Another benefit would be the formation of educational networks that could form a framework for bidding for grant monies to support developments in teaching and learning methodologies. Such collaborative ventures could gain substantial funding for developments in forensic teaching and learning. This could only further enhance forensic education in UK HEIs.
- The development of databases is another of FIRM's objectives and in this the area regional infrastructure could be important. Combinatorial approaches are increasingly used to individualise in the analysis of physical evidence. This will allow institutions that between them have complementary pieces of analytical equipment, to work together on database creation, provided that identical samples could be moved between institutions. This is easier with institutions that are located close together.

We have devised a regional structure that fits these requirements. That structure has to allow regions where a return trip within a day is feasible, where a sufficient number of HEI institutions exists to make FIRM's aims feasible and allow FIRM to grow. The regions that allow this nascent organisation to form are:

- Scotland
- North West and North Wales
- West and Central Midlands
- East Coast
- London and Home Counties
- South Wales and South West

Our progress to date has been limited to using the Regional Student conference as a vehicle to promote regionalisation of FIRM. The West and Central Midlands region have demonstrated the benefits of these by hosting its third annual student conference in 2008 at the University of Derby, having successfully hosted two at Staffordshire University and the University of Wolverhampton. Last year's conference at the University of Wolverhampton, showcased over thirty undergraduate projects, five of them presented orally, whilst the remainder were presented in poster format. Prizes were awarded for the best three talks and best three posters, with students walking away with texts kindly donated by Oxford University Press and John Wiley. This year, there will be participation from most participating Universities within the region, including University of Wolverhampton, Staffordshire University, the University of Derby, de Montfort University and Nottingham Trent University. This year will see similar conferences organised in the North West and Scotland regions. We are hoping that we will encourage Universities to lead FIRM's regional agenda within the Eastern and North Western regions. FIRM is supported by the HEA and The Forensic Institute.

If you are interested in joining this exciting development, please feel free to contact Raul Sutton at the University of Wolverhampton (01902-322134 or R.Sutton@wlv.ac.uk), or Prof Allan Jamieson (0141 202 0700 or al-lanj@theforensicinstitute.com). ■

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The HEA takes on forensic science

The HEA takes on the forensic science portfolio – what impacts will this have for the budding Forensic Scientist?

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Brian Rankin worked for one of the leading forensic science suppliers for about 28 years. He has been involved in the training of police officers of all ranks, scenes of crime officers and the legal profession and is an advocate of an integrated system to support the investigation of crime to court. In 2007 he moved to the University of Teesside as Head of Centre for Forensic investigation. He is currently the President of the Forensic Science Society.

Darren Phillips worked as a forensic scientist for both public and private sector forensic suppliers, specialising in the investigation of biological material and DNA. He then moved into forensic science teaching at Anglia Ruskin University in Cambridge, Kingston University in London and now teaches forensic biology at the University of Abertay in Dundee. He currently sits on Council of the Forensic Science Society.

There are many routes into becoming a qualified forensic scientist within the UK. All forensic science providers have some form of 'in-house training' but prior to this there are a number of different academic paths a potential forensic scientist can take. These can be split into two major paths which can be described as the 'older' and 'newer' routes. Up until now neither of these routes was formally recognised as part of the Higher Education Academy. Brian Rankin, President of the Forensic Science Society said... "it is probably the diversity of subjects which make up forensic science that meant it is difficult to fit forensic science into the HEA".

To become a forensic scientist *per se*, an undergraduate science degree is essential. Traditionally the qualification would be in a fundamental scientific discipline such as biological sciences or chemistry but other specialised subjects will apply to specific areas eg statistics and other 'ology' type subjects such as geology. Graduates could then apply directly to the appropriate forensic provider and receive 'in house training' on the job.

However, a further year of study at Masters level could be carried out in a forensic-based subject whether it is in forensic science itself or in a forensic speciality such as anthropology or archaeology. The benefits of following this 'older' route has been argued to make the individual think and act as a 'scientist' first and foremost with the 'forensic science' aspect of their learning given later to convert the person from a general scientific background into a forensic scientist. For many decades, this route has been the one more favoured by the forensic employers as they could then 'mould' scientifically trained and skilled individuals into their desired subject niche eg biology, chemistry, drugs, toxicology, DNA.

However, times do change and as a direct result of increased media interest in forensic science through programmes such as *CSI* and *Silent Witness*, universities have found a huge market in providing forensic science based undergraduate courses. Pure-based scientific courses have also become less fashionable (partly because of the false impression some students have of them being harder to study, particularly chemistry-based courses).

This has led to a vast number of forensic themed courses on offer to the budding forensic student. A large majority of these courses have minimal and in some situations, inappropriate levels of forensic science content, eg a failing pure-based course that has then had a few law and crime scene modules thrown in and the label 'forensic' added alongside. To an uninformed parent or student this can be extremely misleading and give false hope in finding jobs at the other end of a course.

A key point of interest is that the forensic employers themselves have not actually asked universities to provide forensic science courses and thus students need to appreciate, like any degree, that they are not guaranteed a job at the end of their degree. Indeed, any institution that tries to guarantee that their students will get a forensic science job is giving a woeful dis-service to its student body.

This 'newer' route to qualification does however have a number of well run and appropriately pitched forensic themed courses. The more successful of these have managed to place great emphasis on the analytical science behind the forensic analysis. This is very important for those going on to work in operational laboratories or on to higher study. The fundamentals of chemistry and biology are linked in with more specialist modules such as the analysis of DNA and body fluids, fibre investigation and drugs of abuse to name but a few.

Problem solving and an investigative approach within these courses are of paramount importance to any future career in science, whether it be in forensic science or not. These are also of particular note in the allied forensic investigative subjects that are available for study such as forensic computing and digital crime investigation that do not involve chemistry or biology as a basis of their specialisms. Digital investigations now play an important role in modern society with the proliferation of the Internet and electronic technology such as mobile phones. The role of the forensic investigator within this technical field is explored through 'newer' university courses; something previously not looked at in older more traditional based computing courses.

The HEA takes on forensic science

The skills of problems solving, analytical thinking and an investigative approach can be coupled to other attributes learnt through an appropriate forensic degree such as lateral thinking, adaptability and the ability to communicate important information to one's peers and to lay people – all transferable skills that can be used not only in forensic science but in many other career choices, both scientific and in business.

The most successful of the newer forensic based courses have in effect used the fascinating areas of forensic science as a way of teaching applied sciences to a new generation who have become dis-enfranchised with some of the older, more 'pure-based' science courses.

As the professional body for forensic science the Forensic Science Society has recognised the need for high quality scientific courses and has recently developed and implemented an accreditation scheme to make sure that these important skills are in place when a university decides to provide a forensic based course. The success rate for those universities who gain accreditation is running at about 50%. The list of these 'accredited' courses is available from the Society web-site (www.forensic-science-society.org.uk/information/ae.html).

Students who graduate from these accredited courses have skill sets useful to employers beyond what might be perceived as the narrow forensic field. They have a strong general science background with the associated levels of numeracy, analytical thinking, and a fine eye for detail. They are also computer literate with the ability to express themselves clearly in speech and in writing. A graduate with a good degree in forensic science is a worthy candidate for many posts in the public service and private sector.

The Forensic Science Society is also in detailed discussion with Skills for Justice to take forward the overall accreditation through Skillsmark – a very appropriate partnership aimed at giving assurance to employers and parents while at the same time giving confidence to the students.

It is hoped that partnerships and collaborations can also move forward with the HEA. ■

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HE: Opportunities in Forensic Science

Higher Education: Opportunities in Forensic Science

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A Physics and Mathematics graduate from the University of Leeds, Professor Mennell is Dean in the School of Applied Sciences, Northumbria University and the former Director of the Centre for Forensic Investigation at the University of Teesside. She is a member of the Home Office Forensic Science Advisory Council, Chair of the UK Forensic Science Education Group, a Fellow of the Forensic Science Society and Institute of Measurement & Control, Convenor of the Higher Education Academy's Special Interest Group in Forensic Science and a member of the Skills for Justice Forensic Science Occupational Committee and North East Regional Science Learning Centre Board. Professor Mennell's research interests include the contribution of forensic science to crime detection and investigation; the impact of new scientific and technological developments on forensic science practice; the identification and assessment of forensic science practitioners' skills and abilities; and the identification of current and future education and training needs for forensic science practitioners.

In the UK in the last ten years there has been a huge rise in public interest in forensic science. This interest has seen an increase in the number of UK university courses in 'forensics', the number of students applying for these courses and, importantly from a student and a forensic employer perspective, the number of applicants for each Forensic Science and Crime Scene Investigator post advertised. Alongside this interest, there has been much criticism of universities' involvement in forensic science, particularly from a government, forensic science user and provider perspective (ie SEMTA¹ and Forensic Science on Trial Report²). It is not uncommon for Scientific Support Managers to receive hundreds of applications for one post which may include applicants ranging from graduates and postgraduates to police administrative staff and armed service personnel. The filtering applied in the recruitment process may be difficult to establish and implement and there is variation amongst forces. For example, in some forces those with an MSc are favoured over graduates and non-graduates so an applicant with a degree in forensic or crime scene science is not perceived relevantly or sufficiently qualified to merit an interview³.

As an academic specialising in forensic science education I am a firm believer that universities have a significant role to play in forensic science. In addition to providing specialist advice and services to forensic science users and providers, universities have three primary roles in relation to forensic science³:

1. the provision of high quality relevant courses for future forensic practitioners, with a particular focus on forensic science or specialisms within forensic science such as, crime scene science and digital forensics – developed and delivered in close collaboration with user groups with a clear intention of students entering careers within a particular field of forensic practice
2. the development of current forensic practitioners through their participation in applied research, short courses, conferences and qualifications linked to professional practice
3. supporting and developing the practice of forensic and crime scene science, through the identification, engagement and dissemination of pure and applied research and through our involvement in national forensic policy/strategy groups.

But, perhaps, much more significantly, I believe that students of forensic courses should be provided with the best possible

student experience and opportunities to succeed, both within and outside of forensic science. And, in this respect, I am very pleased with the progress we are making to date to ensure this is the case. For example, in 2005 in response to the SEMTA and Forensic Science on Trial report the UK Forensic Science Education Group was established, comprising senior representatives from forensic science users and providers, the Forensic Science Society, HEA Physical Sciences Centre and a number of universities. The group's aim is to provide recognisable and relevant degrees in 'forensic practice' for students and employers; forensic science users & providers with a pool of high quality 'job-ready' graduates; undergraduates and postgraduates with realistic career expectations and opportunities; and a framework of HE professional development activities for forensic practitioners. UKFSEG has progressed extremely well in its first two years and is now represented on the Skills for Justice (sector skills for criminal justice sector) Forensic Sciences Occupational Committee, the Home Office Forensic Science Advisory Council and Home Office Stakeholder group. Current workstreams include working with the Forensic Science Society and Skills for Justice to engage academics, Higher Education Institutes and employers in the development and implementation of the FSSoc's accreditation scheme, aligned with the currently developing National Occupation Standards for Forensic Science.

Considerable progress has also been made in developing forensic science networks within HE. For example, in 2006 the HEA special interest group (SIG) in forensic science was resurrected to share expertise in the development and delivery of learning & teaching approaches; share materials and develop new learning & teaching resources; provide a forum to disseminate good practice; and provide links to external resources. The group held four events in 2007; the first event of the group was held in May at Northumbria University and dealt with practical projects in forensic science. Follow up events, were held at the Universities of Teesside, Northumbria and Glamorgan covering: *Practical Skills in Crime Scene Investigation, Skills and Accreditation* and *Current Issues in Forensic Science*. Speakers comprised staff from other university forensic science departments, the police service and forensic science providers. The forensic science SIG welcomes any and all academics with an interest in forensic science and is planning four events for 2008.

HE: Opportunities in Forensic Science

I believe initiatives and activities of this kind, together with our greater engagement with forensic policy and strategy groups, are demonstrating our role in supporting the development of forensic science practitioners; helping to ensure the provision of high quality relevant courses for future forensic practitioners as well as the development of current forensic practitioners and policy makers through their participation in applied research, short courses, conferences and qualifications linked to professional practice.

However, in addition, if we are to ensure our courses are up to date, relevant and informed we need to understand the significant changes that are currently taking place in the way that forensic science is used and delivered; including the establishment of the Forensic Science Service as a government-owned company ('GovCo'), the merger of Forensic Alliance and LGC to form LGC Forensics and the greater use of competitive tendering. These changes have seen the creation of a more commercial marketplace in forensic science. Whilst, this emerging forensic market has produced some substantial benefits for forensic science users, in terms of cost, quality and service, it has also raised some questions relating to how forensic services should be delivered in the future; so that both forces and providers can plan with confidence and between them ensure that forensic science remains fit for purpose⁴. The balance between in-force provision and external suppliers together with the need to maximise forensic information and intelligence in more dispersed environments therefore become important issues to add to the debate. In addition, UK Government policy is also a key driver with strategy focusing on reducing crime, increasing sanction detections, offenders brought to justice and tackling public perception of crime. So, forensic science users and providers are under increasing pressure to build on the success of initiatives such as the DNA expansion programme⁵ to ensure that forensic science is used effectively across all crime types, from both an outcome based and cost perspective. Developments in technology are also facilitating this outcome and the police are embracing new technologies such as *Lantern*, a hand-held, mobile fingerprinting unit, which enables fingerprints to be captured electronically away from the police station, enabling suspects to be identified and arrested at a very stage of a crime being committed. In addition, custody offices are being brought into the 21st century to deliver enhanced evidence recovery and identification capability, that will provide the police with rapid access to data such as DNA,

fingerprint, palmprints, footwear, mobile phone, credit card and weapons, again enabling identifications to be confirmed and related information about possible criminal activities of suspects to be obtained quickly. As these technological drivers provide opportunities to improve performance and capability, they also prompt issues in relation to the validation of new techniques, ethics, proportionality, quality and standards⁶. For example, public confidence has been tested as a result of issues surrounding the growth of the national DNA database and cases such as the Omagh Bombing and Damilola Taylor, which led to the recent independent enquiries; and the quality standards framework for the delivery of forensic science has been opened up for debate with the introduction of the role of the Forensic Science Regulator and the establishment of the Forensic Science Advisory Council.

What is clear is that if we are to establish forensic science as a credible academic discipline area, from both a student and industry perspective, then we need to engage in all three areas of activity highlighted above and understand the current issues, opportunities and challenges facing forensic science, to ensure we meet, respond and influence its current and future needs. The establishment of forensic science as a recognised HEA discipline area is clearly another step in the right direction.

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Considerable progress has also been made in developing forensic science networks within HE.

Development of Context-Based Forensic Chemistry Labs for Chemistry Undergraduates

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Context-Based Forensic Chemistry Labs

The rationale behind this project was to contextualise the first year chemistry laboratory practicals for undergraduate students on the Forensic and Environmental Analysis degree programme at Dublin Institute of Technology (DIT). Previous programme evaluation forums revealed that the students were disappointed with the lack of 'forensic laboratories' in the first year of their course.

With the aim of enhancing the student morale and retention, a team of colleagues worked to introduce context based laboratories with a forensic chemistry emphasis in first year. Academic staff at DIT approached lecturers at Strathclyde University to collaborate on the project as Strathclyde have been teaching forensic science for over 40 years. The Higher Education Academy project funding awarded enabled the group to take on an undergraduate research assistant whose role was to review the current first year chemistry laboratories at DIT and to restructure the content to give a context that emphasised forensic applications.

The research assistant was provided with a variety of experiments, both in the DIT and in Strathclyde University, to consider incorporating. He selected a series of experiments and structured the practicals into a laboratory pack. Each laboratory pack included; (i) a fictional newspaper article, (ii) a fictional letter to the forensic science lab, (iii) a sketch of a crime scene, (iv) a chemical risk assessment, (v) the learning outcomes for the practical, (vi) the experimental procedure, (vii) questions relating to the laboratory practical, (viii) a student self assessment grid for skills demonstrated and (ix) demonstrator and technical staff guidelines.

Three case studies were devised and the title and the chemistry content of each are shown below:

1. Fingerprinting Laboratory – Volatility, adsorption, material types and porosity, polymerisation, chemical staining, fluorescence.
2. Identification of Poisons – Anion and cation testing, inorganic reactions, atomic emission (flame photometry) and wet chemistry analysis.
3. Cheque Forgery – TLC of inks, Solvent polarity and extraction techniques.

Each of the laboratory practicals above cover similar content as the traditional chemistry practicals had done but now they have a 'purpose' - to solve a crime.

The project was developed over the summer months in 2006 and the practicals were piloted with the first year undergraduate Forensic and Environmental Analysis students at DIT over the academic year 2006-2007. The students worked in groups of three and were presented with 'evidence' to analyse in the laboratory with the aim of identifying a poison or a crime suspect on a weekly basis. Individual student evaluation forms were completed anonymously by the student cohort. In general, the results of the evaluations revealed that:

- the students enjoyed carrying out the forensic science laboratory practicals.
- the 'case studies' were appropriate to each experiment and very realistic.
- the context-based approach was preferred to the traditional 'recipe-style' laboratory.
- the alignment of the lecture material with the laboratory work was appreciated by the students.
- the students felt that they had acquired forensic chemistry skills in their first year.

The evaluation has progressed for the academic year 2007-2008 and the experimental work has been expanded upon where possible (eg introducing shoe printing techniques).

Context-Based Forensic Chemistry Labs

The project also encompassed second year forensic practicals which entailed an approach that involved problem solving to a greater extent. The second year practicals were grouped into two case studies; Case Study A is a suspected murder case and Case Study B is based on an assault on a prisoner in police custody. The class are split into pairs and are given a case study to solve over five, 3 hour laboratory sessions (one a week) to identify their suspect. The laboratory has to be planned by the group and the practical work is carried out on rotation with a workstation for TLC (lipstick/ inks/ shoe polish), comparative microscope (fibres/ glass), refractive index (glass) and flame photometry. The format of the case study laboratory pack is similar to that for the first year laboratory pack but it is presented as one case study to be solved and is more student-driven. It is felt that in second year the students have acquired the basic laboratory skills from the previous year and they are expected to apply them and to determine the probability that their crime suspect is guilty using statistical methods.

Current work focuses on designing problem based learning laboratories for final year students. Preliminary case studies have been very successful and further work is required to fine tune the structure and design of the practicals. It is hoped that this context-based approach can be expanded on in other subject areas such as physical chemistry and organic chemistry. ■

Current work focuses on designing problem based learning laboratories for final year students.

The rationale behind this project was to contextualise the first year chemistry laboratory practicals for... the Forensic and Environmental Analysis degree programme...

A resource for Forensic Science teaching

Developing a case work resource for Forensic Science teaching

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This project aims to develop a teaching, learning and assessment resource for forensic science, drawing on material from complete crime investigation casefiles not just forensic science results. In addition to forensic science information, these casefiles typically include pathology reports, crime scene photographs, plans and videos, witness statements etc. The purpose is to satisfy learning outcomes related to practical problem solving skills and also the scientific methods and reasoning styles which underpin the process of crime investigation. There is a recognised shortage of such material, primarily due to the difficulty of obtaining and then adapting original contextual material in a format suitable for teaching.

The first author has access to a large body of police investigative material concerned with all aspects of physical evidence in serious crime investigation, and suitable cases will be chosen and anonymised to satisfy a range of learning objectives including contextual complexity, decision making and the needs of assessment. The use of real case work, which necessarily includes complex and often irrelevant contextual information, drives students to develop a wide range of skills including the ability to develop and test hypotheses and use science to eliminate possibilities. Feedback indicates that there is no difficulty in fully engaging students in this type of activity and it will afford an opportunity for staff to teach practical forensic science, as distinct from core scientific principles.

It is intended that the case histories will include some 'single evidence type' cases, some 'complex' cases and importantly, a number suitable for use in student assessment. The learning outcomes were scoped by the project team with additional input from the Scottish Universities Forensic Science Group. Preliminary work is underway to validate the learning outcomes, assess whether the proposed delivery mechanism is appropriate, and devise a suitable method of assessment. The project involves three main strands – theory, delivery and assessment, and some preliminary work.

Preliminary work

The various case files have been retrieved and an initial registry and evaluation made. These cases are sometimes historic, and the wide range of photographic and textual material available in them makes the selection of an appropriate delivery mechanism of paramount importance. After an initial selection of cases to fulfil the three groups (simple/complex/assessment), the material will be processed and final permission sought from the Police Forces concerned. Each of the cases selected for use will be where there has been a conviction and any appeal process have been completed. All cases will be anonymised although other location details and textual information will be retained.

1. Theory

It is necessary to link the teaching of the basic scientific method, scientific reasoning styles and principles which underpin forensic science, together with practical crime investigation concepts and techniques, to the case work material. The material can thus be used by way of example and reinforcement, as well as to satisfy the learning outcomes. A first draft of the learning outcomes has been made and a further review is underway.

2. Delivery

The material must be made accessible in a way which supports the learning outcomes, encompasses the needs of a wide range of teaching environments and allows staged release of information. As in a real case, this release must be capable of being controlled by the lecturer. In addition, it should allow the process of student investigation to mimic as far as possible a real scene, real witness statements and real scientific results. Ideally, it would allow students' own laboratory results to be fed seamlessly into the case history. We believe we have identified a suitable software platform which is already used to record and 'revisit' scenes and also to provide an overview for Court purposes by a number of Police Forces. A licence for the production of DVDs using the software has been purchased; the DVD will include all the material required for a staged release of an entire case. When supplied as a teaching aid the DVDs are stand alone and no additional software is required. A number of staff and students at RGU will be trained in the use of this software during April 2008.

A resource for Forensic Science teaching

3. Assessment

The project aims to produce suggested guidelines for the process of teaching and assessment, strictly related to the specific case studies. These guidelines may not be of universal application but are intended to have sufficiently defined outcomes, broad scientific objectives and clear mechanisms to allow use in a range of teaching environments. We exclude assessment of students' existing laboratory practical work and reports, which will be subject to existing arrangements.

Although the primary purpose was to develop their investigative skills, the use of group work and peer assessment was employed to promote a range of other transferable skills. Additional assessment criteria included critical thinking skills, team working skills and self reflection – an important skill which helps students re-evaluate their work and is crucial for forensic investigation. A Virtual Learning Environment was used to promote online collaboration, and allow monitoring of activity. ■

A real murder case has already been used (2007) as the basis for a paper based forensic investigation activity with undergraduate and postgraduate students in the UK and in Holland. Students combined lectures with interactive sessions where they questioned an 'expert' and were required to justify requests for additional forensic reports to establish facts, eliminate hypotheses and build a case around a murder investigation. Assessment factors included production of an initial plan defining the scenes, the process of obtaining laboratory information, and a final formal investigative report.

Each of the cases selected for use will be where there has been a conviction and any appeal process have been completed.

This project aims to develop a teaching, learning and assessment resource... drawing on material from complete crime investigation casefiles not just forensic science results.

Forensic Science Resources on the Centre's web site

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Forensic Science Resources

The Centre undertakes a range of activities to support forensic science and links to resources and current developments can be found on our web site.

Forensic science Student Employability Guides

These handouts are designed for undergraduate students to give them information about the employability skills they are acquiring during their degrees and how to sell these skills to employers. These can be downloaded and printed or multiple paper copies can be ordered from the Centre.

(www.heacademy.ac.uk/assets/ps/documents/fs_employability_sheet.pdf)

Report: Forensic Science: Implications for Higher Education

A report on the research undertaken because of employers' concerns about the increasing number of Forensic Science degree courses in relation to the number of jobs available in the Forensic sector. (Allied to this there was concern about the quality of science skills these courses deliver compared to labour market requirements).

(www.heacademy.ac.uk/assets/ps/documents/forensic_science_implications_for_higher_education_2004.pdf)

Development Projects

Teaching and learning projects funded by the Centre.

- Development of a Forensic Science Module as an Access Route to Facilitate Further Study of Physical Sciences
(www.heacademy.ac.uk/physsci/projects/detail/current_projects/development_of_a_forensic_science_module_as_an_access_route_to_facilitate_further_study_of_physical_sciences)

- Quantitative skills in forensic science
(www.heacademy.ac.uk/physsci/projects/detail/completed_projects/quantitative_skills_in_forensic_science)

- Opportunities in Forensic Science
(www.heacademy.ac.uk/assets/ps/documents/projects/current/opportunities_in_forensic_science.pdf)

- Development of Project-Based Forensic and Environmental Practical Activities for Integration into the Chemistry Curriculum

(www.heacademy.ac.uk/assets/ps/documents/projects/current/project_based_forensic_and_environmental_practical_activities.pdf)

- Development of Synthetic Blood Substitute
(www.heacademy.ac.uk/assets/ps/documents/projects/completed/development_of_synthetic_blood_substitute.pdf)

- Forensic science casework teaching resource project
(www.heacademy.ac.uk/physsci/projects/detail/development_projects_2007/barclay_dp_2007)

The Forensic Science Special Interest Group

The Centre supports the development of special interest groups to identify, support, develop and monitor work in specific areas of the curriculum or in specific approaches to learning and teaching.

For more details of the Forensic Science SIG see back cover of this newsletter.

(www.heacademy.ac.uk/physsci/home/networking/sig/forensicscience)

Publications

The Centre produces an extensive range of publications available to download. Below are some of the items related to Forensic Science in our publications.

1. New Directions
Web Based Resources for Forensic Science
New Directions Issue 1, May 2003, pp52-54
(www.heacademy.ac.uk/assets/ps/documents/new_directions/new_directions/ps0049_new_directions_issue1_may_2003_1.pdf)
2. Conference Proceedings
Forensic Research and Teaching Conference (FORREST) Proceedings 2006
(www.heacademy.ac.uk/assets/ps/documents/FORREST/2006/FORREST_2006_proceedings.pdf)
3. Book Reviews
Published in our journal, Physical Sciences Educational Reviews
Principles of Bloodstain Pattern Analysis Volume 8 Issue 1 (July, 2007) p42
Authors
Stuart H James, Paul E Kish and T Paulette Sutton
Publishers/Suppliers
CRC Press, Taylor & Francis Group
(www.heacademy.ac.uk/assets/ps/documents/journal/journal_july_2007_vol8_is1.pdf)

Forensic Science Resources

Forensic Evidence: Science & the Criminal Law

Volume 7 Issue 1 (July, 2006) p19
 Authors
 Terence F Kiely
 Publishers/Suppliers
 Taylor and Francis
 (www.heacademy.ac.uk/assets/ps/documents/journal/ps0023_journal_vol7_issue1_jul_2006.pdf)

Forensic Science: an introduction to scientific & investigative techniques

Volume 7 Issue 1 (July, 2006) p20
 Authors
 Stuart H James, Jon J Nordby (editors)
 Publishers/Suppliers
 CRC Press
 (www.heacademy.ac.uk/assets/ps/documents/journal/ps0023_journal_vol7_issue1_jul_2006.pdf)

Forensic Science Laboratory Manual and Workbook

Volume 7 Issue 1 (July, 2006) p22
 Authors
 Thomas Kubic, Nicholas Petraco
 Publishers/Suppliers
 Taylor and Francis
 (www.heacademy.ac.uk/assets/ps/documents/journal/ps0023_journal_vol7_issue1_jul_2006.pdf)

Crime Scene to Court: the essentials of forensic science

Volume 5 Issue 2 (December, 2004) p6
 Authors
 P C White (editor)
 Publishers/Suppliers
 The Royal Society of Chemistry
 (www.heacademy.ac.uk/assets/ps/documents/journal/ps0020_journal_vol5_issue2_dec_2004.pdf)

Forensic Science

Volume 5 Issue 2 (December, 2004) p9
 Authors
 Andrew R W Jackson and Julie M Jackson
 Publishers/Suppliers
 Pearson
 (www.heacademy.ac.uk/assets/ps/documents/journal/ps0020_journal_vol5_issue2_dec_2004.pdf)

4. Newsletter articles

Forensic Science Regulator Newsletter 1
 Wavelength Vol 3 Issue 2 (October, 2007) p10

The first of the newsletters which the Regulator intends to publish regularly to keep stakeholders informed of progress in establishing the office of the Forensic Science Regulator.

(www.heacademy.ac.uk/assets/ps/documents/newsletters/newsletters/news3w2_final.pdf p10)

Forensic Science

Wavelength Vol 1 issue 1 (April, 2005) p15
 A response to the SEMTA report 'Forensic Science: Implications for Higher Education 2004' by John Palfreyman, School of Contemporary Sciences, University of Abertay, Dundee DD1 1HG
 (www.heacademy.ac.uk/assets/ps/documents/newsletters/newsletters/ps0063_wavelength_issue1_jun_2005.pdf)

Quantitative Skills in Forensic Science

Wavelength Vol 1 issue 1 (April, 2005) p5
 Development Project Report from Dr C Adam (et al), Lennard-Jones Laboratories, School of Chemistry & Physics, University of Keele, Keele, Staffordshire ST5 5BG
 (www.heacademy.ac.uk/assets/ps/documents/newsletters/newsletters/ps0063_wavelength_issue1_jun_2005.pdf)

The Centre produces an extensive range of publications available to download.

The Centre undertakes a range of activities to support forensic science and links to resources and current developments can be found on our web site.

4th National FORREST (FORensic RESearch and Teaching) Conference

1-3 July 2008

The Robert Gordon University, Aberdeen, Scotland

The FORREST Conference is aimed at promoting and developing links between Higher Education and forensic science research.

The conference will showcase some of the latest developments in forensic research and the teaching of the subject. With the continued support of the Physical Sciences Subject Centre, the conference will also provide a platform for the very best students and projects to be presented to an influential audience and an opportunity to meet potential employers.

A combination of presentations, posters and workshops is envisaged in order to provide delegates with an opportunity to learn and network with colleagues and some of the best forensic practitioners.

More information and registration is available on the website, www.heacademy.ac.uk/forrest

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The Physical Sciences Centre is funded by the Higher Education Academy (www.heacademy.ac.uk) and is part of the Academy's Subject Network. The Centre is supported by the Universities of Hull, Liverpool and Surrey.

Offers to contribute to the newsletter are welcomed. Please contact the Centre.

Forensic Science Special Interest Group

The forensic science SIG, organised by the Centre, involves people interested in the teaching, learning and research of forensic science. The SIG is an opportunity for people to share ideas, resources and experiences within the forensic science community. It is also a forum for like-minded people to support each other and offer advice on forensic science related matters.

There are a number of organisations and other groups represented on the SIG, such as the Forensic Institute Research Network (FIRN) and the UK Forensic Science Education Group. Involvement in the SIG will help put you in touch with these organisations in order to keep up to date with all the latest developments in UK forensic science education and research. In addition, there is a range of regional and national events which are supported by, and advertised through the SIG.

Mailing List

The SIG hosts a JISCmail list so if you would like to join simply send an email to:

jiscmail@jiscmail.ac.uk

with the following text (*all on one line*) in the body of the email message:

subscribe forensic-education
FIRSTNAME LASTNAME
(replacing 'FIRSTNAME LASTNAME' with your own name) ■

Events —2008—

- Workshop on 1st year Experience in Physics, 14th May, Royal Society, Edinburgh
- E/PBL making it work (SIG), 21st May, Chemistry Dept, University of Birmingham
- New Technology in Learning and Teaching, 11th June, University of Hull
- Maths for chemistry (SIG), 18th June, RSC, London
- FORREST Conference, 1st-3rd July, Robert Gordon University, Aberdeen
- Variety in Chemistry Education Conference, 28/29th August, Dublin City University
- Physics in Higher Education Conference, 4/5th September, University of Edinburgh
- Outreach in Collaboration II Conference, 10/11th September, CELS, University of Nottingham

Contact us or visit our
web site for details.