Forensic Science Policy & Management: An International Journal

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ufpm20

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Available online: 11 Aug 2011

To cite this article: John Cassella & Carole McCartney (2011): Lowering the Drawbridges: Legal and Forensic Science Education for the 21st Century, Forensic Science Policy & Management: An International Journal, 2:2, 81-93

To link to this article: http://dx.doi.org/10.1080/19409044.2011.594145

Forensic Science Policy and Management:, 2: 81–93, 2011

ISSN: 1940-9044 print / 1940-9036 online
DOI: 10.1080/19409044.2011.594145

Taylor & Francis
Taylor & Francis Group

Lowering the Drawbridges: Legal and Forensic Science Education for the 21st Century

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Abstract *Notwithstanding the significant investigatory and prosecutorial benefits of forensic science, the marriage of law and science has most often been represented as discordant: a marriage of "opposites" (Wonder 1989) that's "troubled" (Haack 2009). Yet most critics rely upon clichéd representations or "caricatures" (Roberts 2012) to demonstrate how science and law represent two cultures. When official concerns over the potentially deleterious coupling within the criminal justice system have reached a fevered pitch, the fallout has often been a chorus of disapproval addressed to forensic science, but also denigration of legal professionals for being unable or unwilling to forge a symbiotic relationship with forensic scientists. The National Research Council's 2009 National Academy of Sciences Report on forensic science heralds the latest call for greater collaboration between the law and science, particularly in higher education institutions (HEIs). To investigate the potential for interdisciplinary cooperation, a workshop was held in the UK, attended by academics and practitioners from scientific, policing, and legal backgrounds. The workshop marked the commencement of a project to facilitate building vital connections in the academy, enabling law and science academics to "lower their drawbridges." This article outlines some of the discussion to elucidate areas of consensus, and where further dialogue is required before progress is possible, but aims to strike a note of optimism that the "cultural divide" should not be taken to be so wide as to be beyond the legal and forensic science academy to bridge.*

Keywords Legal education, forensic science education, law and science

Introduction

The institutions of *law* and *science* are often depicted as opposing sides of a "disciplinary divide" (Roberts 2012), evoking C.P. Snow's "cultural divide" between science and the humanities (Snow 1959). Most often, the "uneasy relationship" (Berger and Solan 2008, p. 847) between the "inevitable bedfellows" (Condlin 1999, p. 183) of science and law is explained with reference to "a particular conception of science and scientific knowledge" (de Melo-Martin 2008, p. 9), and the law "is frequently invoked in a loose and sometime careless fashion" (Roberts 2012, p. 5). Reliance upon caricatures reinforces lax stereotypes while adumbrating two cultures that, in reality, are not as homogenous as portrayed, are interconnected, and share many characteristics: "Law is not unitary. Neither is science," says Mashaw (2003, p. 135). It is also possible that customary science/law narratives exaggerate the extent to which law and science "clash," when some scientific disciplines are central to developments in legislation, regulation, and policy (Jasanoff 1990, 1995), and science and law is often co-produced (Jasanoff 2005). In criminal law, however, most authors believe the cultural divide meme retains its explanatory power. As Saks and Faigman write, the "first, and most basic" reason for the failure of courts to expose flaws in forensic science "is the cultural divide that separates law and science" (2008, p. 161).

Regardless of this wider science and law debate (which brevity dictates must be continued elsewhere), there remain apposite and acute concerns regarding the status of science utilized by the law, in particular forensic science and its interplay with criminal law. Research into the causes of wrongful convictions clearly demonstrates that if legal professionals are unable to competently assess and handle scientific evidence, the pursuit of justice can be

Received 22 February 2011; accepted 1 June 2011.
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seriously hampered, potentially leading to factual errors, as well as the misrepresentation and/or misinterpretation of evidence. In England and Wales, many infamous miscarriages of justice

> had at their heart scientific evidence that was either not disclosed, flawed, or misrepresented in court. The Irish bombing trials used methods of testing for explosives that were invalid, while cases such as that of Kevin Callan[1] exemplify grave miscarriages caused by flawed scientific evidence. The successful appeal of Sally Clark[2] focused attention again on the non-disclosure by the prosecution of important medical evidence as well as the use of erroneous statistical calculations (McCartney 2006, p. 5).

In the United States, Garrett and Neufeld studied trial transcripts where forensic analysts gave testimony in cases where innocent defendants were on trial,[3] finding numerous trials where "forensic analysts called by the prosecution provided invalid testimony at trial—that is, testimony with conclusions misstating empirical data or wholly unsupported by empirical data" (2009, p. 2). They found that defense counsel rarely cross-examined analysts, instructed experts of their own, or challenged invalid forensic testimony. Expert evidence can be then (mis)communicated to fact finders and decision makers alike, many of who will struggle with scientific evidence, compounding problems and potentially hindering their appreciation of the reliability, relevance, and weight of scientific evidence. The "epistemic incompetence" of the jury (Mnookin 2008) is then extending to counsel, leaving them incapable of gauging the reliability of the scientific evidence adduced; according to Latham (2008), "There is still widespread scientific illiteracy at the bar" (p. 33).

Judges have also been similarly strongly criticized: "There are serious problems with the ways in which law receives and manages expert evidence . . . trial and appellate judges are not without their share of responsibility for the unfortunate state of affairs," states Edmond (2011, p. 177). Saks and Faigman (2008, p. 166) state that judges are "failing in their obligations if they persist in their scientific ignorance." Such scientific illiteracy on the part of the legal profession, when coupled with the flaws in forensic science,[4] form a toxic combination.[5]

Furthermore, there is a risk that science can become shrouded in mystery and given a veil of infallibility. Authors have been unable to accurately demarcate the newly labeled 'CSI effect' (Gabel 2010), whereby lay people in courtrooms enter with entrenched cultural expectations regarding scientific evidence, garnered from viewing of multifarious popular television crime series (Cole and Dioso-Villa 2007). These are not such novel issues (widespread suspension of critical faculties in the face of 'science' existed even before the white coat became symbolic attire for its emissaries), albeit their diagnosis and treatment is rare. However, claims McCartney (2008) "Problems with forensic science, and mistakes made by experts, are rehearsed in the media on an increasingly regular basis. Normally absent from such criticisms is any examination of why it was that no lawyer was able to spot a potential issue or had drawn attention to errors before damage was done" (p. 992).

While it is accepted that 'bad' (or 'junk' in American parlance) science is being accepted by juries, "there is a latent problem that often falls in the shadow of bad science: bad lawyering" (Gabel 2010, p. 236). Perhaps trial lawyers can no longer escape critical scrutiny of their role, as Gabel (2010, p. 236) highlights:

> While the NAS Report primarily thrashed forensic science and crime labs, it did contain the somewhat hushed admonition that lawyers and judges often have insufficient training and background in scientific methodology and they often fail to fully comprehend the approaches employed by different forensic science disciplines and the reliability of the forensic science evidence that is offered at trial.

In order to prevent the criminal justice process from being derailed by these potential difficulties with utilizing scientific evidence, epistemic incompetence, credulity, and bad lawyering, it is argued that the legal professional should seek to shoulder greater responsibility when adducing expert evidence (Saks 2001; Gershman 2003; Raeder 2007; Moriarty 2007; see Caudill 2003 and 2011 for an alternate view). Saks (2001) calls for trial lawyers to be subject to disciplinary action if they knowingly rely upon and adduce invalid expert evidence, while Gianelli and McMunigal (2007) argue that there should be an ethical responsibility to not adduce flawed expert evidence. In many legal jurisdictions, there is already a burden placed upon the judge to act as a gatekeeper, with criteria set out upon which they must base admissibility decisions. If it were agreed that counsel should assume an enhanced responsibility to do some preliminary 'reliability' test of expert evidence they wish to adduce, even before a judge acts as gatekeeper, it would first require trial lawyers to understand some basic scientific principles and the scientific method at a bare minimum (arguably, as should any educated adult). Yet the so-called 'scientific illiteracy' among the general public reaches into the legal community with lawyers "naturally intimidated and overwhelmed by scientific evidence" (Findley 2008, p. 931), or as Latham explains, "Lawyers, though they may be popular science enthusiasts, typically have little exposure to scientific training, and do not know how to read scientific literature critically" (Latham 2008, p. 33).[6] This is not surprising when looking at the scientific education (or lack thereof) of law students, most of which have not studied any scientific discipline post-16 (McCartney 2008).

It is the case that the majority of England and Wales university law students drop science early in their in education; 18 percent of Leeds first-year law students (intake of 2008) have one (rarely more) science A-levels (see McCartney 2008).[7] In the United States in the academic year 2007–2008, 4.3% of law school applicants had a natural science degree; 2.7% had engineering, 0.8% computer science and 0.9% had health professional degrees.[8] As Gabel (2010, p. 257) explains: "The overwhelming majority of 'feeder' degrees for law school are arts and humanities and business administration. Additionally, due to advanced placement courses, some students have not even taken a mathematics or science class since high school." The traditional law degree then dilates this educational lacuna by failing to introduce law students to basic scientific concepts, or provide grounding in the work of scientists. "Although law school could be described as a glorified liberal arts education, it generally does not include courses in research methods and statistics. Even where such courses are available, they are taken by a small percentage of students," explain Saks and Faigman (2008, p. 161). Yet if law students are not studying any science beyond a high-school level and can then avoid any further science at pre- or post-qualification stages of their education, when are lawyers learning how to handle 'evidence' and interpret information—the mainstay of their occupation? If becoming a criminal law practitioner, lawyers may often be required to assess scientific evidence, yet have no educated basis upon which to do this. Such a criticism could also include a basic understanding of statistics, which is also barely introduced, if at all, on a traditional law degree. According to Gabel (2010), "Mathematics and science are a black hole in legal education" (p. 257). Even if considering a law degree a liberal arts degree, and not a vocational one, there are wider benefits of a 'broadly conceived' law degree in tackling scientific illiteracy among the general population.

This omission in law degrees has increasingly been lamented (see McCartney 2008). For instance, according to Gabel (2010), "Law students underestimate the amount of science and mathematics required for legal practice even in areas unrelated to forensic evidence issues" (p. 258), and yet the disciplines of law and science remain divided not just paradigmatically but often geographically; scientists and lawyers rarely meet on a university campus (barely ever at conferences) or find themselves researching co-operatively; they will also not be catered for in the same libraries or literature sources, or by the same research funding bodies. In England and Wales, the Quality Assurance Agency for Higher Education (QAA) benchmark for a B.A. law degree has no mention of science, but does state that graduates should have numeracy skills and should be able "where relevant and as the basis for an argument, to use, present, and evaluate information provided in numerical or statistical form."[9] The Solicitors Regulation Authority validates the LLB 'qualifying' law degree for potential solicitors. Their criteria make no mention of numeracy skills, or make any reference to science, interdisciplinary knowledge, or evidence handling.[10]

The place of 'law' within forensic science university curricula is perhaps more uncertain. In the United Kingdom, the QAA sets national benchmarks for degrees, detailing the expectations of graduate skills and abilities in that discipline. As yet, there is no QAA benchmark for forensic science or crime scene examination (although one is reportedly in development), making the content of degrees in this field much more variable and, perhaps, arbitrary. In 2007, an independent Forensic Science Regulator Unit for England and Wales was created. While the regulator does not have an explicit remit to oversee forensic science education, his draft code of practice states under 'competence' that forensic science providers should utilize the available national occupational standards (NOS) that are promulgated by the Skills Council for the field, 'Skills for Justice.' There are copious NOS relating to forensic skills, nearly all of which commence with the requirement that all practitioners know and understand "the implications for your work of current law," although there is no stand-alone NOS for legal knowledge.

There is an important qualitative difference between *education* and *training*, and the NOS are directed specifically toward those skills that a practicing forensic practitioner is expected to possess, although these are not necessarily directly mappable onto a degree program. Skills for Justice also sought in 2010 to supplant the UK's Forensic Science Society's (FSSoc) role as an accreditation body for forensic science degrees. Many universities reportedly viewed the FSSoc accreditation as a costly and timely 'optional extra' and had not sought accreditation. The 'Forensic Skillsmark' accreditation scheme was drafted in partnership with the FSSoc so that employers could rely upon graduates as having undertaken a high-quality degree. As yet, Skillsmark accreditation has had little impact with just seven universities going through the accreditation process. As such, there remains a gap in the oversight of UK forensic science degree curricula, with no universally accepted national standards for content and wide variance in the delivery of any legal education (see the later discussion for details).

In the United States, the National Institute of Justice (NIJ) reported in 1999 that there was a need for national standards relating to forensic science education and training (NIJ 1999) and formed a technical working group looking at educational issues. This working group reported in 2003, a year after the creation of a committee on the accreditation of academic programs at the American Academy of Forensic Sciences (AAFS). The AAFS Forensic Science Education Programs Accreditation Commission (FEPAC) began accrediting degree programs in 2004, and to date there are 35 accredited courses. The curriculum

requirements include, "A minimum of 15 semester hours in forensic science coursework that covers the following topics: courtroom testimony; introduction to law; quality assurance; ethics, professional practice, background; evidence identification, collection, processing; and a survey of forensic science" (AAFS 2011, p. 8). With a minimum of fifteen hours spread across such a wide range of important topics, the 'introduction to law' must be very introductory indeed.

It has become increasingly common then for calls to be made for forensic scientists and legal professionals to end their 'dialogue of the deaf' and to communicate effectively (see House of Commons 2005; McCartney 2008; National Research Council & Committee on Identifying the Needs of the Forensic Sciences Community 2009). This requires both legal professionals and forensic scientists to understand the basic principles, vernacular, and nomenclature of both science and law, as well as the working practices and customs of each group of practitioners. Yet while these calls are easily made, there are fewer attempts to identify those who will ensure that this understanding is acquired. The National Research Council and the Committee on Identifying the Needs of the Forensic Sciences Community (2009) produced one of the most high-profile recent reports calling for greater interdisciplinarity, stating, "Judges, lawyers, and law students can benefit from a greater understanding of the scientific bases underlying the forensic sciences", (p. 218). It firmly places the responsibility for imparting this understanding with prequalification legal educators: "It might be too late to effectively train most lawyers and judges once they have entered their professional fields . . . For the long term, the best way to get lawyers and judges up to speed is for law schools to offer better courses in forensic science in their curricula" (NRC 2009, p. 8–15).

The Committee recommended that to effect this change:

> Better connections must be established and promoted among experts in forensic science and legal scholars and practitioners . . . Law schools should enhance this connection by offering courses in forensic science, by offering credit for forensic science courses students take in other colleges, and by developing joint degree programs (NRC 2009, p. 8–17).

Such proposals are laudable, and yet leave most law educators with a daunting task—how to go about such remodelling of their educational structures? Who is going to make the connections with the forensic science scholars?

When undertaking any new challenge, it is always good practice to discover how others have previously surmounted similar challenges. However, as Merlino and colleagues (2008, p. 193) point out, "No clear picture exists of the educational landscape with respect to interdisciplinary education about science in law schools." So where should a keen law lecturer turn for inspiration or guidance? It is not as straightforward as it may seem to well-intentioned committees when advocating such modifications to degree programs, to make significant changes, even without the additional complication of crossing disciplines.

The 'Lowering the Drawbridges' Project

In 2009, funding was received from the University of Leeds to commence a project to facilitate the building of vital connections in the academy to ensure that legal and forensic science undergraduate education remains 'fit for purpose' in the 21st century. It aims to start the process of bringing science to law students, and law to forensic science students, in the hope that by commencing cross-disciplinary study during the pre-qualification stage, there is created the potential for ending the 'dialogue of the deaf' at the professional stage of their careers. (And if they do not proceed into a legal/forensic science career, their greater knowledge base may accrue other 'transferable skills' or benefits.)

In early 2009, two surveys were emailed to law and forensic science lecturers to gather information on the teaching of law to forensic science students, and forensic science to law students. Some of the results are represented graphically below.

Clearly, the majority of forensic science degrees include some legal education, mostly conducted by legal academics. It is interesting to note, however, that some respondents claimed that law teaching is *not* important to their programs of study. There are perhaps questions concerning how much law is required in a forensic science program—when forensic science respondents claim there is "just enough" or even "too much" law, how much is enough? If forensic science is science in the pursuit of justice, should there be a lot more law in these courses? If forensic science graduates need simply to be 'good' scientists, is there time in a packed curriculum to study law? There are perhaps also questions regarding those who should be providing the legal education. Can forensic science lecturers provide this or should it be the preserve of law lecturers? There are problems with both approaches: do law lecturers understand sufficiently what forensic science students require, and do forensic science lecturers understand what is necessary on the curriculum? This project aims to eventually find some more concrete answers to such questions.

Further to these preliminary surveys, in 2009 a workshop was held at Leeds Metropolitan University, UK, attended by over 40 academics and practitioners from scientific and legal backgrounds. This workshop aimed to address issues related to teaching forensic science and

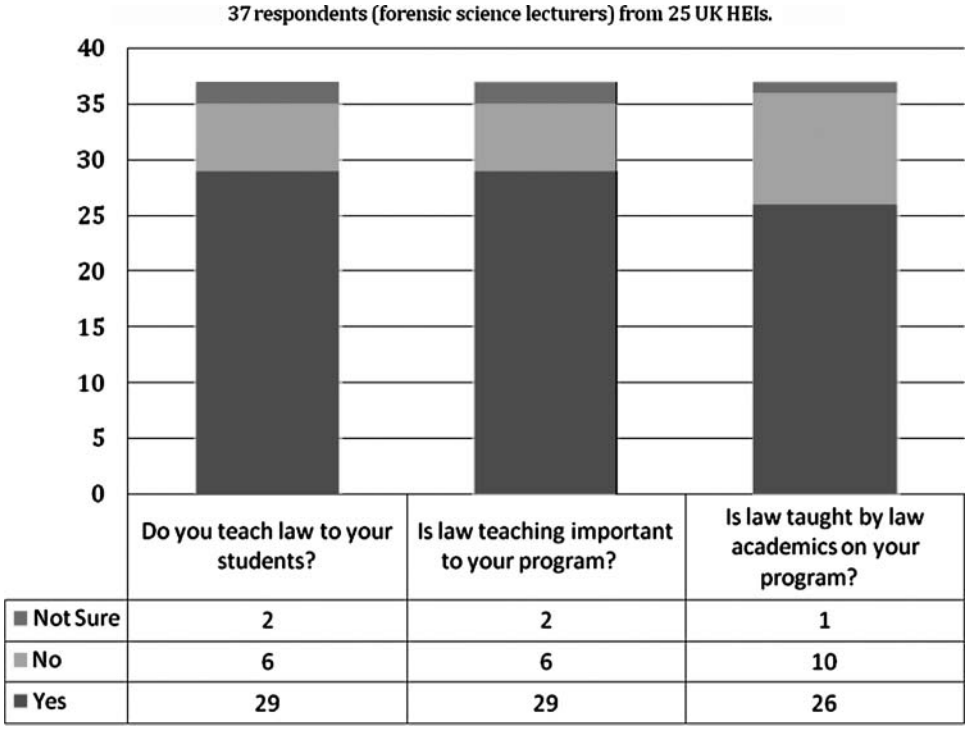


Figure 1. Law teaching on forensic programs.

law by bringing together legal and forensic science academics to explore avenues for improving collaboration and communication between the two disciplines. Discussion at the workshop quickly revealed that the specific issues under consideration comprised only a sub-section of a host of issues that emanate from the highly complex array of aims and interests (and stakeholders) of these two disciplines, only some of which were complementary.

It was readily apparent that glibly stating that academics need to find the time to design more pedagogically robust material that can cross-disciplinary boundaries was obtuse, if not impertinent, given the levels of

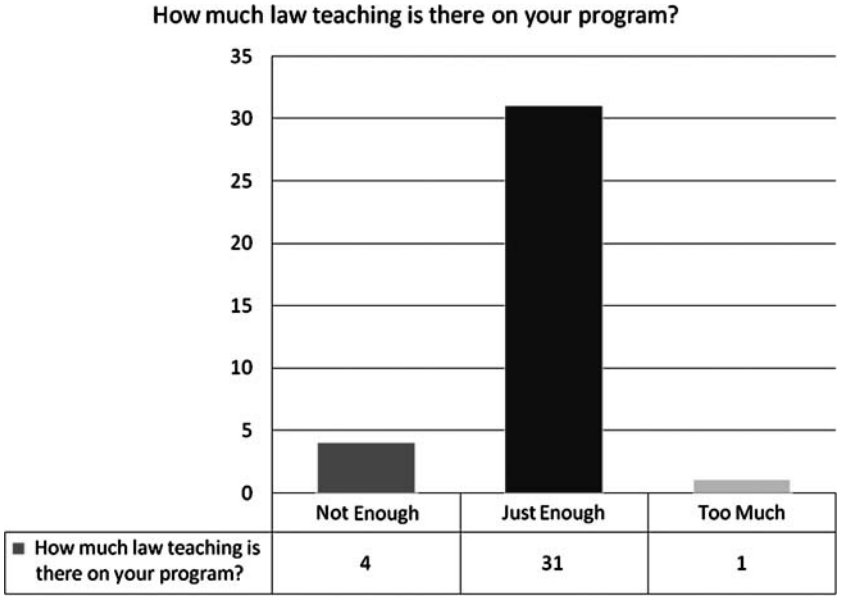
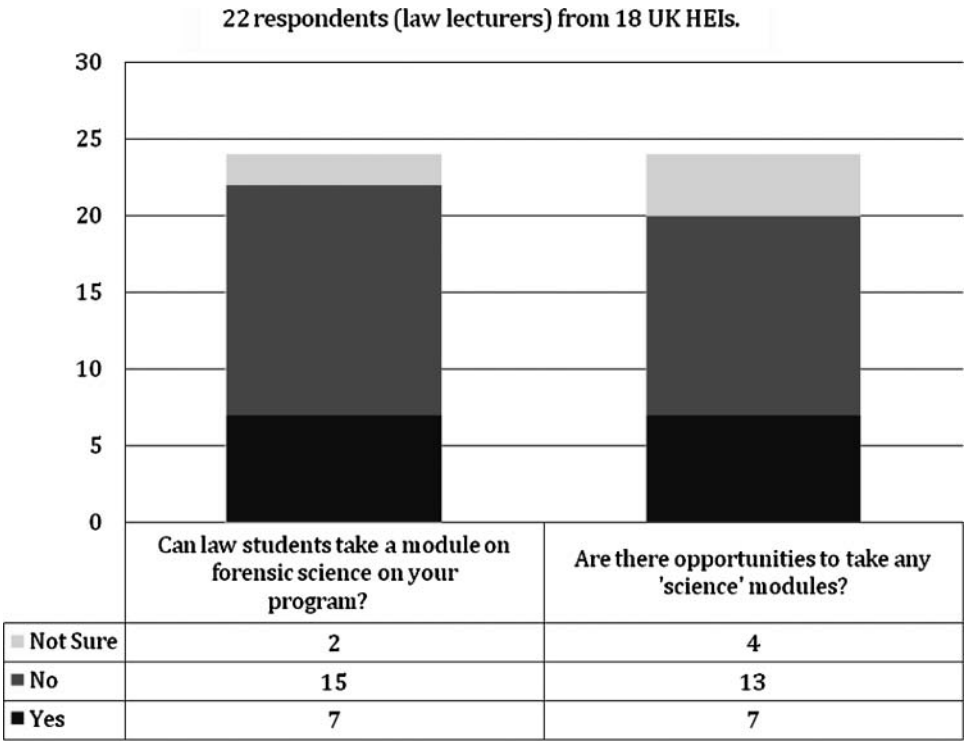


Figure 2. Amount of law teaching on forensic programs.



	Can law students take a module on forensic science on your program?	Are there opportunities to take any 'science' modules?
Not Sure	2	4
No	15	13
Yes	7	7

Figure 3. How much forensic science is taught in your law program?

dedication and effort already demonstrated by many forensic science and law academics across the UK. What could be easily concluded without much contestation is that achieving anything like true cross-disciplinary educational aims requires a far more fundamental rethinking, necessitating a new common language in order that those academics working in diverse areas of academic pursuit can understand one another. This is an essential prerequisite before 'systems' can be made to communicate (to facilitate student and/or staff movement across schools/faculties etc.), and ultimately, students can be taught to study, converse, and be understood across law/science borders. Finding the route(s) to true cross-disciplinary experiences for students is, however, highly complex, although this did not preclude insightful discussion throughout the workshop, some of which is summarized below.

The workshop was not designed, nor could it have been possible to expect in just one day, to come to firm conclusions about solutions that could then be easily implemented (nor of course, could we tackle myriad causal issues of the law/science divide that lay without the realm of the higher education system). The aim of the workshop was not to produce a template or 'best practice' guidance for academics, but to begin the process of understanding how to recognize best practice and what form any guidance may eventually take. The organizers hoped to scope out the 'problem' (if it is conceded there were one) and a range of potential future actions that may enable colleagues to begin collaborations and cooperative working. As could be expected, there were a range of concerns, a variety of opinions, and rarely a consensus. We hope here to reflect some of the wide-ranging views and highlight areas where consensus was found.

Workshop Discussion

Is it Necessary for Forensic Science Students to Study Law?

The perception that there is a career pathway for graduates of forensic science courses dictates that many degrees will incorporate a strong emphasis on training students to fulfill the 'role' of a forensic scientist (although these are many and diverse). Notwithstanding the ongoing debate surrounding whether forensic science students receive enough 'core' science during their degree, there was a consensus that forensic science students need to understand the role of a forensic scientist within the legal process and what would be expected of them in the various roles they may encounter. It is then essential that students gained a thorough understanding of the context in which their future careers may be situated, involving the law and the legal system (justifying the *forensic* prefix to their science degree).

There are strong arguments that the best forensic scientists will have a deep understanding of the forensic element of their profession (see Margot 2011). To understand what procedures/tests etc. are required in any given investigation, the scientist needs to be able to isolate the question they are attempting to answer. That question will very often be framed as a legal question (though not always). For example, if a forensic examiner understands that the police have seized materials from the scene of a potential murder, then they can prepare themselves to answer more fully questions that will undoubtedly arise when examining exhibits from the scene or items seized, such as potential weapons or clothing worn by suspects and victims (e.g. is there blood present? How much, where, and whose is it? Is there any significance to the blood from an investigative perspective?).[11] Indeed, it is often the job of the forensic scientist to discern whether there is a legal problem to be solved at all (i.e., at the scene of an apparent suicide or upon recovery of some bone fragments). As one forensic examiner remarked, they didn't truly understand their role as a forensic scientist until they studied law because they then understood *why* they were doing certain tests and what other tests may be required.

Very often, a forensic scientist's greatest value is providing guidance to investigators and other legal professionals by advising on what needs investigating and on what value can be added to an investigation by certain examinations. An understanding of what the investigators need to know (and eventually, perhaps the courts) will make their advice more astute. One of the greatest disappointments of many forensic scientists is that their advice is not sought more often and at earlier opportunities. A proficient forensic scientist will be able to present their findings to a legal and lay audience and guide them with their understanding of what the legal professionals are trying to achieve.

For many, the controversy is not the lack of law during the typical forensic science undergraduate degree, but the lack of science. There are those who doubt that forensic science programs are sufficiently 'scientific,' and so insisting upon incorporating more 'non-science' elements may be counter-productive to them. However, the idea that forensic science graduates need only be good scientists is increasingly under challenge, although many continue to argue that good graduates can learn to apply their scientific knowledge to the forensic arena after graduation—that the forensic element can be taught by their employers and gained through experience. While there is merit in the argument that forensic science students need first and foremost to be good scientists, it cannot be denied that a fuller understanding of the 'forensic' aspect of their job would make them better forensic scientists just as Roberts (Forthcoming) explains: "Good science with no scope for legal applications can never be good *forensic science*" [Roberts' emphasis].

What is the Current Situation with Respect to Law Teaching Within Forensic Science Programs?

Most of those attending the workshop attested that they had already taught law to their forensic science students. Whilst some forensic science lecturers claimed that their students were well versed in the law, many others lamented that their students had no prior understanding of criminal proceedings, and that their goal was simply to provide them with some rudimentary grasp of the basics, while others claimed that most law was simply irrelevant for forensic science students: "It's instantly forgettable," said one workshop attendee. Opinion clearly differed over how much law should be required for forensic science students and over the ability of many forensic science students to complete the law assessments, as they differ markedly from those in their science modules. This was often the motivation behind forensic science lecturers taking law classes: they hoped only to cover what was strictly necessary and in a form digestible to science students, with assessment that they could successfully pass—a bespoke course. Most often, this translates into a single module on the basics of the criminal process and criminal justice system. Seven of the 33 forensic science lecturers who responded to the survey claimed that there was no involvement of legal academics with their program. Many others explained that they simply made compulsory the basic 'English legal system'-type modules in the first-year law program for their first-year science students.

There were also reciprocal arrangements whereby an introductory module on forensic science was provided by the science faculty staff for law students, in return for a 'Science in Court' module for forensic science students run by the law school. Those that sent their students to the law school for their legal training often felt that their students were 'thrown in the deep end' and often struggled (11 of the 33 forensic science respondents explained that the law school took their students with no input at all from their department)—though others countered that the students found it stimulating to be among full-time law students.

Forensic science lecturers also reported in the survey and during the workshops that they were able to introduce relevant legal aspects to their students as they were proceeding through their curricula. For example, they would inform them of the legal aspects of casework and discuss with students the appropriate legal matters pertaining to, for example, drugs, alcohol, sexual offences, etc. For some, they explained that they would have a guest lecture during the three-year course, covering something pertinent, such as expert evidence, either in addition or as their sole legal education provision. More common is a mock-court scenario, with forensic science students taught how to present evidence in court using

mock trials. For many, there was law school involvement with such events, either using the staff of the law school or sometimes their students.

What Should be Taught and By Whom?

It is clear from the survey responses and workshop that there was no consensus on what precisely should be taught to forensic science students and by whom. Most commonly, forensic science lecturers believed that they could convey the 'law' to their students, while legal academics believed that legal education was best left to legal academics. Such an approach is quite understandable and was mirrored when tackling the obverse of this question. This lack of consensus presents an obvious stumbling block in trying to develop pedagogic materials to assist educators and students. Most obviously, forensic science students need to have an understanding of the legal regimes surrounding investigations and their role in the investigative process, as Roberts (2009, p. 447) makes clear: "Forensic scientists are subject to legal strictures no less than any other professional investigator, and they therefore have powerful incentives to know the legal rules which apply to their situation and to strive at all times to conduct themselves in accordance with the law." A basic grasp of police powers and the law surrounding assault and murder, among others, would then assist them to understand the machinations of investigations. There are, of course, other laws that have a direct bearing on the work of forensic scientists, including criminal or civil procedure rules, which set out the role of an expert witness. Learning this aspect of law, how police conduct investigations and the legal regime within which they operate, the criminal/civil process, as well as the duties of the expert witness, would all be essential learning outcomes of any forensic science degree program. The question then arises: how much depth does the student need to go into these fields?

Some attendees questioned whether the relevant professional and regulatory bodies could provide guidance or requirements. For example, in England and Wales, the Solicitors Regulation Authority regulates the LLB qualifying law degree, stipulating what modules are foundational and must be delivered to have accredited status, although success in modifying these 'foundation' modules is extremely limited. Attempts to accredit forensic science degree programs are still very limited (as of June 2011, just 7 universities have endorsed forensic degrees out of the 39 that offer them), and there are no requirements in current regimes to provide legal education beyond the skills required to deliver expert evidence in court. The first step must then be to reach a consensus on the 'ideal' legal components of a forensic science degree. It may be that employers dictate their terms in such a scenario.

Is It Necessary for Law Students to be Taught About Forensic Science?

This session examined what scientific education law students ought to receive, working on the premise that there should be some element(s) of science available to those students who either want it or need it for their future careers. It would be wrong, however, to give the impression that there is universal acceptance that science ought to be a necessary element of a law curriculum. Clearly it may not be appropriate for every law student to delve into forensic science, particularly those who do not wish to enter into the legal profession, and so it may be entirely inappropriate to make compulsory any scientific training. As with all subjects, there is a real issue of curriculum overload. If science were to be introduced, what should be left out to make room? There are already many demands made of the law curriculum (not least by regulators), and many more legal topics that many would consider essential that are omitted due to pressures on the timetable. There is some acceptance, however, that a basic grounding in science could be relevant for any undergraduate student, pursuing almost any career, and that there are important transferable skills and knowledge to be gained. The current lack of scientific education at the university level for law students was viewed as disabling them.

There was also a clear agreement that there is insufficient forensic science being delivered and taught to those law students on legal courses who did have an interest in practicing law (either criminal or any other area of law). This may be explained partially by the aversion to science seen among law undergraduates, which also extends to the academics. Many legal academics may not have studied science for some considerable time, which may naturally lead to reluctance to introduce science into a law curriculum (or more probably, simply a lack of appreciation that anything is 'missing'). Just as legal professionals call upon forensic scientists to deliver science when required in the legal process, it may be then that forensic scientists need to be engaged when it is necessary to deliver teaching in the area. There was then a consensus that it would be helpful to the legal community if some instruction on the basic methodology of science were introduced at the pre-qualification stage for lawyers. Statistics and reasoning, in particular, need attention to establish how theories are presented, evaluated, and what can be deduced from the evidence.

What is the Current Situation with Respect to Teaching Forensic Science Within Law Programs?

Many law lecturers expressed frustration at the (perceived) obstacles to teaching forensic science to their law

students. Many were deterred because of a belief that they would be required to deliver science materials themselves and were not qualified to do so: "I would like to incorporate aspects of forensic science but don't feel confident about the science aspect," said one participant. Most law lecturers admitted that the only time that forensic science entered their teaching was when dealing with expert evidence during evidence modules, and then only in relation to the laws regarding the reception of expert evidence. However, many denounced the scientific awareness of their law students, saying, "The students lack even the most basic knowledge."[12] While most admitted to having no or inadequate forensic science instruction (or coverage of the basic principles of science or statistics, for example), those that did have some provision expressed great student satisfaction with the modules, saying, "This module is much in demand and popular with students," and "our most popular elective."

While the modules were popular, there were issues raised over the standards/levels between law modules and science modules, particularly if they carried the same credit weighting. There appeared some suspicion that science modules could be easier/harder than law modules and assessments were varied, meaning that some students could benefit or be disadvantaged by the lack of comparability. Reports of law students receiving 95 percent in a science module where such a mark would be virtually unattainable in any law modules caused concerns. Clearly, the assessments and levels of marking, etc., and credits for modules from other disciplines is an issue that would need resolving.

What Should Be Taught and By Whom?

Discussion and survey feedback on what should be included in any forensic science teaching to law students ranged widely between simply raising 'forensic awareness,' or conveying the basic principles of science, to engaging in contentious scientific debate and undertaking introductory science modules, including laboratory experience. Those keenest on spanning the disciplinary divide believed that law students would benefit from a thorough grounding in scientific disciplines and knowledge of the working life of a forensic scientist. Others suggested that a brief rundown of different techniques popularly employed (such a DNA and fingerprints, footwear, toxicology, etc.) was more than adequate. The opposite end of the spectrum countered that there may be more important things to include on the undergraduate law degree that should take precedence over forensic science. If you were to ask a cross-section of law lecturers what they would like to see on the undergraduate law degree, you will get almost as many different answers as lecturers, a similar response no doubt predictable among forensic science lecturers.

While it was agreed that students, particularly those wishing to pursue a legal career, should understand the law surrounding expert evidence, there was less agreement over whether this should extend to the law regarding police investigations and forensic inquiry (including issues such as continuity and integrity). The value of teaching case histories where the law and forensic science had combined to result in a failure of justice was emphasized, however. There was also deliberation over whether law students should understand the science behind forensic techniques (suggestions that there could be a *Dummies Guide to* ... for various forensic disciplines), or whether they should simply know what questions to ask of the experts and how to assess their credibility. However, it would be difficult to determine what questions to ask an expert without a grasp of the limits of the evidence and the science underlying a technique like DNA profiling, or even to know when an expert could be of assistance or is required.

It was agreed that law students are not sufficiently instructed in how to deal with 'evidence' or 'facts' (mirroring a protracted debate among evidence scholars). Many declared that law students had poor evaluation skills, with this merely extending to scientific facts, despite an appreciation of probative value being an essential skill for a lawyer. In a lengthy survey response, reproduced here in part, David Carson, an evidence law lecturer, spelled out his vision of the problem and solution:

> The core problem is the intellectual narrowness of the law degree ... dominated by cognitive, knowing, objectives. Whilst there are distinctive, and critically important, doing skills (e.g., legal research and detailed analysis of statutes and case law precedents), these are focused upon in one year, the first, and then honed over the next two albeit on different topics. An 'add-on knowledge' mentality (whether law and forensics or law and psychology) is never going to allow legal studies to become genuinely inter-disciplinary. Law students need, not just for richer intellectual stimulation but also to be more creative in the range of occupations they enter, a much broader range of intellectual skills, such as in scientific methodology, in broader inferential reasoning, probability theory, and presentation. Being aware of what other disciplines can offer, perhaps as expert evidence, is no substitute for abilities to think differently, to possess a forensic or sociological imagination. Equally it is demeaning to encourage other disciplines to think that knowing 'the law' on a topic is all they can, or should, be competent with. Investigators and forensic scientists need (and can be given) much more from lawyers than knowledge of the exclusionary rules of evidence. If there are to be developments ... it should be through a focus on forensic investigation, assessment, presentation, and proof. That would require the development of a broader range of intellectual skills, not just the broadening of the curriculum. That would focus upon the many problems with our legal system.

There was disagreement over whether legal academics should take responsibility for this. There was almost unanimous opinion that forensic science lecturers should not be left to instruct science students in the law, but there appeared to be less apprehension when considering whether law lecturers could teach scientific principles. However, it was stressed that in any experiential learning, or more advanced science, a scientist could teach it far better.

Nearly all elective science modules presently available to law students are taught in science departments with little interaction between staff and departments over content, assessment, etc. This is regrettable, but many interpreted this as explicable by a general lack of communication or any ties between science and law faculties. As participants bemoaned, there is a cultural divide in universities between 'hard' sciences and the 'softer' science (if law can be considered a social science for a moment) departments and staff. This landscape makes collaboration over modules difficult, time consuming, and administratively complex for academics that wish to bridge the divide. As one delegate explained figuratively, "First, we need small walls between departments, not the big ones that we have now."

Workshop Conclusions?

The last session of the workshop asked delegates to engage in discussion on how to address the issues raised, and what next steps were required. The most immediate obstacle to overcome is that, as the workshop and survey responses attest, there is presently no consensus over what is required by each cohort of students. This discord among educators is reflected among students themselves, as is demonstrated in the research into forensic science degrees undertaken by the UK's Skills for Justice body. It reports that when commenting upon course content:

> Comments were wide-ranging and in many cases contradictory. Some students applauded the high science content of their degree program, whilst others complained that there was not enough science content. Similarly, some suggested that there was too much content based on understanding the law, whilst others indicated that there was not enough of this (Skills for Justice 2009, p. 48).

Second, there is no apparent best practice model available for emulation. What is clear is that there is demand for essential groundwork to be carried out so that educators in both disciplines can commence collaborative work, building bespoke modules for students based on sound pedagogic principles and addressing the needs of each cohort—which can and will, of course, vary considerably according to such variables as degree type, level, resources available (including personnel), and the teaching and assessment of the course being tailored to the students.

There are potentially many other barriers and obstacles that may prevent or slow progress. These include practical issues such as the geographic locations and distances between many schools. (Indeed, some universities do not have both a law and a forensic science department.) Finding time for academics to do the essential groundwork was also viewed as a primary stumbling block. There was also conjecture that the majority of academics would not see the value of the enterprise and overcoming reluctance, or that locating enthusiastic collaborators may prove arduous. Academics expressed the sentiment that, in this area, there were presently no sticks to avoid, nor any carrots to be found, so therefore little motivation.

Although resource issues were highlighted, it was felt that with sharing of resources and ensuring that there were not diverse efforts across the country, resources could be managed effectively. There was also mention of tapping into funding for research-led teaching innovations, such as Open Educational Resource (OER) funding, etc. Interim measures, including setting up a network of academics prepared to act as guest lecturers in other departments, could act as an immediate stopgap.

Delegates of the workshop also suggested the establishment of a collaborative multidisciplinary forum or network for the free flow of information between forensic science and law academics and practitioners. How this forum or network would be formed and by whom was a harder question to answer. It was also suggested that immediate steps could be taken on some modules to increase interaction between law and forensic science students, such as including law students in forensic science mock cross-examinations, etc. One thing was certain: academics require the support of their department heads and senior university management. It was reiterated time and again that resources (largely in terms of time and the workload for already over-stretched academics) would be required, and these would not be forthcoming if the university management were not fully supportive of the enterprise.

Conclusion

The work conducted by the scientific community can sometimes be misunderstood, misinterpreted, and/or misrepresented by lawyers and scientists alike. The probative and evidential value of forensic science often needs to be better understood by legal professionals, while controversy continues over 'unreliable' forensic evidence utilized during the criminal process. The 2009 National Academy of Sciences report is just the latest to throw down a gauntlet to educators to take preventative action and bridge the science/law divide at undergraduate level, and yet little reaction has been apparent amid law and

science faculties. This Lowering the Drawbridge project was therefore stimulated by a) the hope that there were educators in the UK who had successfully risen to such a challenge already and from whom lessons could be learned and disseminated; b) the knowledge that many forensic science educators included (with varying success) some basic legal education in their degrees and so had experience of the interdisciplinary process, but for whom this still often remained their bête noire; and c) the wish to build the connections and possible collaborative partnerships with law and forensic science educators.

Not all commentators are optimistic that the present difficulties with specialization will be overcome soon; indeed, some believe it may be insurmountable: "Ignorance of fields outside one's specialty is inevitable," says Latham (2010, p. 34). Such sentiments may be self-fulfilling prophecies if the academy does not take up the challenge to bridge the law/science divide in higher education. Inertia within regulatory bodies and higher education management is a sufficient deterrent for those law colleagues who may entertain thoughts of tinkering with the status quo. Perhaps until the educational and legal regulatory bodies demand more scientific knowledge from legal professionals, science will remain an 'optional extra' in an already over-burdened law curriculum and vice versa.

There is perhaps a risk that we expend precious effort upon a wild goose chase for an 'educational elixir' for the law/science rift, which may be partly based upon false conceptions of both *science* and *law*:

> Certainly changes in the education system might go a long way to closing the breach between the two cultures. . . . But the gap between the two cultures also results from a particular conception of science and scientific knowledge, a conception with enormous influence still, even if science does not actually fit it (deMelo-Martin 2008, p. 9).

Indeed, the authors are not searching within their departments for an educational panacea to a problem with many potential variables that need attending to before a cure or an effective vaccination can be claimed to have been developed. "Money and power are the oldest, simplest, and most common sources of friction between social groups, so no doubt part of the law-science conflict is explained in this way," states Condlin (1999, p. 184).

Yet the authors believe there should be optimism that legal and forensic science educators can work cooperatively to respond to critics and forge new paths in learning and teaching in both law and forensic science, creating an opportunity to take stock and enrich our disciplines; according to Roberts (2007), "If, after all, university scholars and teachers decline to keep their subject in good theoretical, pedagogical, and practical shape, who else will be motivated or qualified to take up the challenge?" (p. 19). Despite the possible size and complexity of the task ahead, the authors have found much enthusiasm for the continuation of the project, with a groundswell of opinion that (perceived or real) obstacles should not be permitted to stymie efforts. There are powerful external drivers that should motivate the introduction of science (and statistical method) into law degrees. Miscarriages of justice involving forensic evidence have provided plentiful opportunity for the legal and scientific communities to reflect upon failings and seek preventative medicine. Most often, trial lawyers have found convenient fall guys (Walker and McCartney 2005) in experts giving testimony. However:

> One might question whether the mechanisms of criminal justice must also shoulder some responsibility. If judges feel unable to assess expert evidence, how is justice to be secured, through avoiding, or unduly simplifying issues and reducing the possibility of legitimate challenge by procedural or cost diktat . . . A better response is to examine whether training in forensic science offered by the Judicial Studies Board, or indeed law schools, is sufficient. With the legal system increasingly dependent on science and technology, educational courses on forensic process must necessarily be part of core training for all legal professionals (Walker and McCartney 2005, p. 129).

It may assist those who are presented with scientific evidence to begin to understand the evidence before them—or even to spot common errors or misunderstandings, or make an educated guess about the reliability of a technique, to have a rudimentary understanding of the scientific method and basic statistics. According to Ross (2011), "It is highly likely that at least some of the well-publicized forensic science 'failures' might well have been avoided had the evidence at the time been adequately tested pre-trial and in the courts by knowledgeable and well-prepared lawyers"(p. 141). Likewise, it would assist all forensic science graduates to have a full and sound understanding of the forensic aspect of their profession, requiring at minimum some basic grounding in law. This should not be beyond the wit of faculty to introduce. As Latham (2010, p. 34) exhorts, we are not interested in turning lawyers into scientists and vice versa, but building a foundation upon which they can build during their professional lives. "Instead of melding the two cultures, we need to establish conditions of cooperation, mutual respect, and mutual reliance between them," he says.

The ambition of the Lowering the Drawbridges project is to stimulate both law and forensic science educators to lower their drawbridges and seek mutually beneficial solutions to common educational problems. This will not only reap benefits for students, but the legal/forensic science professions of the future, and ultimately will assist the criminal justice system in its aims because, as Gabel

(2010) notes, "A broader openness and greater understanding of math and science in the legal field would perhaps lead to fewer wrongful convictions" (p. 256.) If the enthusiasm of the delegates at the workshop were widespread, then law and forensic science educators can indeed assist with the building of a mutual understanding between forensic scientists and legal professionals, a step on the road to answering calls for the professions to minimize some of the risks associated with the use of forensic science in the criminal process. As Condlin (1999, p. 183) wrote over a decade ago when referring to the reluctant bedfellows of law and science: "Not working effectively with one another is no longer an option for either discipline, if it ever was."

Endnotes

1. See Callan, K. 1997. *Kevin Callan's story.* London: Little, Brown and Company.
2. *R v Clark* (2003) EWCA Crim 1020.
3. Defendants were later exonerated by post-conviction DNA testing.
4. For an incisive summary, see the National Research Council's 2009 National Academy of Science's (NAS) Report, which discusses the 'problems' with forensic science, including a lack of scientific bases and methodologies; partisan practitioners; the influence of law enforcement; a lack of funding for research and facilities; and lack of postgraduate training, among others.
5. Such concerns may not be quite so acute in other branches of law, where lawyers working within these fields have "achieved a level of scientific literacy relevant to their work, for example, the patent bar, which always had it; the medical malpractice bar; and those elements of the bar that work in administrative law in science-related areas such as environmental, and food and drug law." (Latham 2008, p. 33).
6. Latham explains that this may be worse in the UK than in the United States due to the specialization in education that is more prevalent in UK universities (2008, p. 33).
7. In England and Wales, the qualifying law degree can be taken at undergraduate level (entrants aged 18), rather than at graduate level as in the United States, so students can come straight from high school, where 'A-levels' are sat in their final year to enter university.
8. Law School Admission Council. 1999 National statistical report: 2003–2004 through 2007–2008. Newtown, PA: LSAC.
9. QAA benchmark for BA Law available at: http://www.qaa.ac.uk/academicinfrastructure/benchmark/honours/law.asp.
10. The Joint Statement on Qualifying Law Degrees prepared jointly by the Law Society and the Bar Council sets out the conditions a law degree course must meet in order to be termed a "qualifying law degree." Available at: http://www.sra.org.uk/students/academic-stage.page.
11. The amount of information required by a practitioner remains debated; however, the potential for contextual bias and observer effects to hamper objective assessment strongly supports arguments for examiners to operate in a 'double-blind' position (See Thompson 2011). This is not to suggest then that the examiner requires investigative facts.
12. This was contrasted by those teaching in Scotland, where students have had to continue science studies for the duration of their high school education.

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