

Science and Justice Research Interest Group (RIG), Northumbria University – Written evidence (FRS0051)

This submission is from a group of academics across law and other disciplines, working within the Science and Justice Research Interest Group at Northumbria University, and should be read in conjunction with our partners in the Northumbria University Forensic Science Unit (FRS0050).

1. Is forensic science contributing to the delivery of justice in the UK?

The lack of reliable and easily accessible data on how much 'forensic science' is being undertaken means any answer is based upon 'guesstimates'. With a commercial marketplace with a vested interest in the confidentiality of contracts etc., and police forces not publishing details of internal forensic services, it is almost impossible to know how much forensic science is being carried out. Even were this known, how much it 'contributes' to justice is an even more difficult question – how 'effective' is the contribution of forensic science? Even with the National DNA Database, where annual statistics are published, it is very difficult to ascertain how 'effective' the database is at securing convictions. We know that running the NDNAD costs about £2.5m a year (£3.9m in 2014-15), while police forces must meet the costs of crime scene investigations and DNA analysis. Yet we are still a long way from establishing whether this is actually 'worthwhile'. The limited knowledge of the effectiveness of DNA has been a prominent theme in the three annual reports of the Biometrics Commissioner. The situation is more vague for other scientific disciplines albeit it is clear there has been a massive contraction in forensic science in the UK.

It is undeniable that forensic science *should* play a role in ensuring justice. The question is whether that role should be diminished because of real (or perceived) 'problems' with forensic science (or cost-effectiveness concerns), or whether attempts should be made to reinvigorate forensic science in the UK. In general, indiscriminate cynicism is unjustified and different approaches may yet succeed in ameliorating many of the risks attendant upon forensic science utilisation. While poor forensic science undoubtedly compounds failings and flaws within the criminal process, it often plays a significant role in preventing and curing wrongful convictions. Yet uncritical faith in forensic science can be misplaced. Scientific evidence can assist the pursuit of justice, but can also hamper it. This paradox leads to polarised reactions. On the one hand, we could have less forensic science, be more sceptical of claims, and ensure there are strict rules concerning admission of scientific evidence at trial, coupled with greater regulation and oversight. An alternative response would lead to more *but better* forensic science – by tackling the scientific deficit, educational poverty and economic pressures; improving the 'science' through research, education (broadly conceived) and investment. What is required is that a 'sceptical' approach is coupled with the encouragement and support of forensic science, so that standards can be raised while facilitating the maturation of forensic science as a branch of applied sciences.

2. What are the current strengths and weaknesses of forensic science in support of justice?

Forensic science is intended to reduce uncertainty by providing objective and verifiable 'facts' to steer decision-makers during the criminal process. The

underlying notion is that when in possession of such facts, justice will (more likely) be achieved as decisions will be informed by the 'true' version of questioned events. And yet, forensic science comes under fire for obfuscation; the introduction of partiality and partisanship; and creating new sites of dispute, ie, for *increasing* uncertainty rather than alleviating it. At worst, forensic science often stands accused of causing wrongful convictions. This paradox is, however, partially attributable to crude language and over-simplification of 'forensic science' as if it constituted a homogenous discipline or coherent entity. The term 'forensic science' is a contrivance, representing a diverse and disparate range of techniques, practices, and technologies. While some forensic technologies are born of rigorous scientific testing and experimentation (the oft-used example being DNA profiling), many others have no, or a minimal, 'scientific' basis. The epithet 'forensic science' thus may be useful for brevity and fluency, a shorthand serving to include all those practices (and practitioners) involved in the collection, testing and interpretation of potential 'tangible' evidence for use in the criminal process. But adulterating 'forensic science' in order to be all-encompassing, invites similarly sweeping generalisations about forensic science 'causing' wrongful convictions. Thus, asking for the 'strengths' and 'weaknesses' of forensic science can only really prompt the answer: 'it depends'.

Forensic science is (most often) tasked with providing impartial evidence via the analysis and interpretation of 'traces' retrieved from a (potential) crime scene, which may indicate what occurred, and who was involved. This is what is expected from forensic science: the recreation of an event, which may or may not invoke sanctions for those involved (a question for the law). Only rarely can this trace analysis conclusively recreate a whole or series of events, particularly in isolation from other evidence. Instead, scientific evidence assists with determining the probability of different hypotheses. More often, forensic science can explain just elements of a questioned event, providing answers to 'sub-source' propositions, for example, 'this DNA profile belongs to A'. It is also often able to reliably assist with 'source level' propositions, i.e., 'the blood at the scene comes from A'. Where forensic science becomes much less reliable, and more dependent upon information from other sources, is when moving up the hierarchy of propositions to the 'activity level': i.e., 'the blood from A was shed when he broke the window'. And what forensic science cannot assist with is 'offence level' propositions, for example, 'A committed burglary'. This limitation was recognised in *Duffy and Shivers* (Omagh bombing case), where a defendant's DNA profile from the tip of a latex glove and seat-belt buckle in an abandoned getaway car, was not proven to link him to the murder plot and he was thus acquitted. When examining occasions in which forensic science has been implicated in a wrongful conviction, often it is because the scientific evidence was relied upon to answer 'activity level' questions, when it was unable to do so. This may be due to other actors pushing scientists, or scientists exaggerating their capabilities, or exaggerating the explanatory power of their data.

3. What is the scientific evidence base for the use of forensic techniques in the investigation and prosecution of crimes? Are there any gaps in that evidence base?

As stated above, the array of methods and disciplines covered by 'forensic techniques' make this question complex. There are clear issues with a lot of 'techniques', as highlighted in the US PCAST report, where methods may be

unvalidated. Some disciplines (in particular, some 'comparison' techniques) are more problematic than others, but even DNA profiling still raises questions around issues such as transference, persistence and interpretation. Acknowledged 'weak points' across disciplines include: where 'new' or unvalidated methods are utilised; where there is fraud, malpractice or other 'human failures'; the role of cognitive bias; and the non-disclosure of evidence. The collection of materials from a crime scene (or equivalent) is the preserve of police or medical practitioners. Many wrongful convictions are set in motion at this early stage, with failings on the part of individuals who may miss exculpatory evidence, contaminate exhibits or samples, or misinterpret traces. They may also fail to forward it to a laboratory, either because of budgetary constraints or by failing to identify the value of an exhibit or trace. Many of the 'problems' with forensic science are then very little to do with the 'science' at all, they are directly related to issues around collection and preservation of evidence, bias, misinterpretation of results, non-disclosure etc. While undoubtedly there needs to be more scientific research (see later), there should also be a focus upon these other vital issues.

4. How can the Criminal Justice System be equipped with robust, accurate and transparent forensic science? What channels of communication are needed between scientists, lawyers and the judiciary?

There are clear issues relating to communication between scientists and the legal professions, but there is also a significant issue of communication and collaboration between police and scientists. This is most relevant when it comes to forming case strategies and understanding what test results mean, during the investigative stage. The introduction of the 'market' and the commodification of forensic science (and the introduction of Streamline Forensic Reporting – (SFR) have worsened these critical relationships between investigators and scientists. While efforts have been made to instigate legal requirements to 'assure' the reliability of scientific evidence before used in the criminal process, (see Q.5) these often apply late in the 'process' (and most often post-charging) and are aimed at admission (or not) at court. Hence the focus on communication between scientists and legal professionals. Arguably, better communication between scientists and the police would lead to poor or unreliable evidence being identified and rejected earlier in the investigative process, a far more ideal outcome than persisting with a flawed case.

There are also concerns about the availability of forensic evidence to the defence, with forensic service providers (FSPs) in the UK charging large sums of money for access to data and results of forensic tests. This deficit is even more critical when facing 'SFR1' forms with the very limited information they provide. It is a mockery of 'equality of arms' if people who are unable to receive public funding, or draw upon private means, are convicted upon scientific evidence not available to the defence. This becomes acute post-conviction, where the disclosure regime that operates pre-trial, ceases to have effect (see submission by Inside Justice on the retention and disclosure of forensic exhibits and the Science and Justice RIG submission to the Justice Committee inquiry into disclosure for further details).

Despite varied recommendations put forth by many of the critical reports on forensic science, reforms that perhaps could tackle some root causes, such as

investing in research; ensuring the independence of scientists from law enforcement; and educational efforts, have been overlooked. Of course, continued budget-cutting and the 'bargain basement' approach to procuring services would first have to be reversed for these reforms to have a chance of success. Forensic science reforms should always be contemplated within the context of the CJS. Many of the safeguards against wrongful convictions must reside within fair and rational legal rules and professional working cultures fostered by appropriate training and management, assured by accreditation, quality assurance and validation processes, within not just forensic science, but the police, prosecution, judiciary and legal profession. Importantly, there also needs to be a broadening of science education to incorporate those who have to understand scientific evidence. Indeed, the US NRC Report enjoined educators to extend their remit to include law enforcement, pathologists, the Bar, the judiciary, the general public and policymakers, though interestingly not journalists who are at least complicit in, if not liable for, much misinformation. A scientifically literate populace might be better able to detect unreliable evidence. No matter the level of understanding, decision-making by all must be informed by the apprehension that forensic science has never been, and will never be, infallible.

5. What is the level of understanding of forensic science within the Criminal Justice System amongst lawyers, judges and juries? How can it be improved?

Poor. Knowledge and understanding of the procedural rules relevant to the admissibility of expert evidence, including forensic science evidence, is also poor. Davies and Piasecki have shown that one year after the introduction Criminal Practice Direction 19 and the amendment of Part 19 of the Criminal Procedure Rules (Part 19 – then Part 33) 30% of respondents from the criminal Bar had no knowledge of Part 19. Of the 70% that were aware 75% indicated it had had little or no effect on the admissibility of evidence in the cases in which they were involved. There have been recent initiatives to ensure all barristers are properly trained to deal with vulnerable witnesses – a specific training programme devised and all barristers who prosecute criminal cases are obliged to take part. Similar training in forensics is essential if lawyers are to be equipped to recognise potential flaws in forensic evidence and ensure that only reliable evidence is put before the tribunal of fact.

The ability of judges to interpret and apply 'correctly' (assuming there is a 'correct' decision) complex tests for whether scientific evidence is 'sufficiently reliable' is complicated by time and resources limitations and multifarious other external pressures and considerations. Within the confines that these pressures impose on the trial process, very difficult questions have to be addressed (and will not have been addressed if cases are disposed of by way of guilty plea or do not reach a Crown Court trial). Even if a technique has a valid scientific basis has proven reliable in its application, how can it be ascertained that it was correctly applied in the present case? What are the error rates associated with the technique, and are there any pertinent factors that could jeopardise the reliability of the testing in this particular instance? Even where ostensibly demanding hurdles for scientific evidence exist (such as the *Daubert* test in many US jurisdictions), decisions to admit such evidence often still appear arbitrary and inconsistent. In addition, such hurdles may come too late in the criminal process, presenting a critical safeguard at a very late juncture. However, if a particular

expert, expertise, or evidence type is regularly deemed inadmissible, there may be wider ramifications when police or legal professionals lose confidence and stakeholders may insist upon greater controls or regulation before using that scientist/technique in the future. This should be welcomed but is a lengthy process, with no guarantee that suspects will not be charged and prosecuted in the meantime upon similar evidence, and comes with a (perhaps unrealistic) requirement that the police are attentive to judicial decisions and deftly adapt their investigative techniques to only include those with a judicial seal of approval.

6. Is the current training available for practitioners, lawyers and the judiciary appropriate?

We are not aware that the judiciary is specifically trained in forensic science. Similarly, forensic science training is very rarely available (if at all) to those training for legal practice. It forms no part of the requirements for a Qualifying Law Degree, the Graduate Diploma in Law/ Common Professional Examination, Legal Practice Course or the Bar Professional Training Course. Nor does it form part of the compulsory elements of pupillage training or new practitioner training for barristers or CPD. Training is therefore optional. It ought to form a compulsory module on the initial training of all lawyers, criminal judges and magistrates' court legal advisers, as well as being part of refresher training for lawyers and the judiciary at regular intervals. McCartney and Cassella have studied the opportunities for educational cross-fertilisation between law students and forensic science students – an innovation that could reap significant rewards later in professional practice. Frustratingly, inter-disciplinary education within HE remains extremely limited.

7. Is the current market for forensic services in England and Wales sustainable? Are changes needed to ensure forensic science provision is maintained at the level required? What are the risks of a market approach, for example what happens if a provider goes out of business? And what is the impact on quality?

While the lack of accurate, accessible, data on spending on forensic science in the UK has been regularly identified as problematic, the Home Office admit to a decline in spending on external forensic services of about 40 per cent between 2010 and 2015/16. While the police increase their forensic workload to save costs (with the attendant risk of a lack of independence and impartiality), the 'marketplace' for FSPs shrinks, leaving providers vulnerable and the market lacking resilience. Bandy and Hartley conclude: 'the continued fall in spending put more pressure on the FSPs' turnover and profitability and, therefore, poses questions about the sustainability of the market'. This has led to a dangerous situation in respect of available expertise in some disciplines, particularly fibre analysis and other less often used techniques. For example, the Regulator reports that there are now just 12 fully qualified toxicology reporting officers in England and Wales. The driving down of costs leaves some FSPs unable to be cost-effective, particularly when also meeting the costs of accreditation. The Regulator has commented that: 'too much money has been and is continuing to be driven out of forensic science provision'.

Prioritising budget concerns often leads to poor decision-making. Cases do not receive the treatment they may require to ensure the reliability of conclusions drawn from the evidence. The introduction of SFR exacerbates significant issues

over the 'consumer-led' approach to purchasing forensic services. The risk of due process being abbreviated or abandoned when 'science' has 'proven' guilt was highlighted some years ago, but such risks may have been heightened with the introduction of SFR. Anecdotal evidence from legal professionals is mounting that the criminal process is being pared down when there is scientific evidence. This may even invert the presumption of innocence, the burden of proof shifting to suspects: 'We have found your DNA at the crime scene, provide an innocent explanation for it' (a particular risk now that the Court of Appeal has ruled that 'DNA only' cases are permissible). The dangers inherent in speeding up investigations, or diminishing due process safeguards, are well rehearsed within the wrongful conviction literature. There are thus significant issues raised by SFR and access to justice that needs urgent interrogation.

There is still heavy reliance upon the professional integrity of individual practitioners. The institutional pressures they face are supposedly balanced by their scientific professionalism; however, customers demanding "useful" scientific assistance may choose other providers who are more obliging, or can refuse to pay for speculative testing. And what about the situation where the scientist is aware that a potentially exculpatory test has not been ordered? There is no legal duty to pursue every conceivable avenue of scientific inquiry or every possibility of exculpation, and police will rarely order extensive tests (with an eye on budgets). Private consultants are constrained by costs and keeping their customers happy, hoping to gain a reputation for satisfying consumer expectations, in order to win and retain market share. The Codes state that all forensic practitioners should be governed by the principles of "independence, impartiality and integrity." According to the Regulator, organizational structures do not hinder working to these principles, yet this seems overly optimistic if a scientist is directly employed by, or works directly alongside, the police. While one might wish to believe in the integrity of all law enforcement and forensic science personnel wherever institutionally located, but it would be naive to forego rigorous quality assurance mechanisms and frameworks in favour of wishful thinking.

8. Is the system of accreditation working successfully to ensure standardised results and the highest quality analysis and interpretation of significance of evidence?

The purpose of the Regulator is to establish and 'enforce' quality standards, to reduce the risk of quality failings. The major problem with the FSR however is non-compliance with these quality standards (and the limited remit of the role, which does not include a raft of areas that impact upon forensic science). Albeit, the Regulator concedes that no reasonable set of quality standards could guarantee the prevention of determined (and potentially criminal) malpractice. The FSR has relied on voluntary accreditation with the UKAS process focussing upon the management of labs, methods and procedures in the lab. To some extent, this offers some uniformity in methods, ensuring that minimum requirements are met. However, it does not provide any guarantee of the credibility and quality of the final outcomes of processes as no attempt is made to evaluate the work output of providers. Neither does it evaluate the interpretation of scientific evidence nor detect the presence of errors caused by analytical anomalies or practitioners' negligence and misconduct (neither can it address errors/failings that occur prior to exhibits reaching a lab). It is reported in the FSR 2017 annual report that 23 accreditation visits were carried out by

UKAS, with over 700 nonconformities reported, including: insufficient control of data; inadequate business continuity; test methods and validation not conforming to the Regulator's requirements; irregularities in accommodation and environmental conditions; and inadequate personnel knowledge of the Regulator's Codes. While these nonconformities are worrying, none of the issues concern scrutiny of the work output of providers. It also of course offers no guidance as to whether the testing was 'useful'.

The interpretation of significance of evidence requires guidance and standards for evidence evaluation, which do not currently exist. Interpretation continues to rely largely on experts' opinions, based ostensibly on experience. The lack of objective criteria poses significant risks to evidence reliability and consistency. Also, the detection of errors entails the use of purpose-driven quality assurance practices by service providers and the inspection of these practices by the Regulator. But the current system of accreditation is inconsistent, often superficial, and is not sufficiently robust to provide the necessary assurance of quality of forensic science services or achieve the objectives of the systems of monitoring and evaluation. If it were, it ought surely to have uncovered the causes of the recent scandals at Randox Testing Services (RTS) and Metropolitan Police Forensic Lab. Both were accredited labs, but the usual checks were unable to detect either scandal. The FSR annual reports also indicate that there is a consistent increase in the number and complexity of quality-related issues referred to the Regulator since 2014. Some of these issues emanate from the flawed assumption that accreditation provides the solution to all forensic science problems.

One positive feature of the current regulation is the requirement for self-reporting of quality-related issues by providers. Yet while some providers oblige, there is no indication that it is general practice across the board. Reporting is not under the control of the Regulator, neither can the Regulator provide incentives to encourage reporting. Given the chance of criminal proceedings after the RTS case, it is possible that providers will be unwilling to report similar incidences. Also, the competitive marketplace, with short-term contracts and frequent turnover between suppliers, can only increase the chances that some providers will not report failures. Robust systems for monitoring do not currently exist, then, within forensic science. Given the accreditation status of the forensic science labs involved in the recent scandals, the delay in the detection of cases, a limited ability to detect misconduct and negligence, and the extent of damage and impact on the CJS and public confidence, instead of relying on accreditation, scheduled monitoring and scrutiny of forensic science providers' activities and outcomes may be required. With the limited ability of criminal proceedings to uncover issues of scientific dishonesty, building safeguards to assure the quality of forensic science must be championed within the forensic science community to supplement court procedures.

9. What role should the Forensic Science Regulator have? If the FSR is to have statutory powers, what should these be?

While statutory powers will provide recognition for the FSR and legal backing for action, the efficacy of regulation will depend on the establishment of specific regulatory practices. In light of the challenges and inefficiencies of regulation, the proposed powers to issue compliance notices and investigate the practice of FSPs whose activities pose risks to the CJS may carry some deterrent effect and

may address non-compliance issues, which have been propagated by a laissez-faire approach to regulation. However, with the majority of commercial providers demonstrating satisfactory quality management practices, the enforcement powers will be more beneficial for the Regulator in ensuring police in-house forensics providers put in place sufficient quality management systems.

For the investigation of cases, the Bill provides some legal powers but does not prescribe ways of obtaining information nor the scope of investigations. The current approach of the FSR is one of reacting to reported cases, which is capable of ascertaining the causes of reported failures, but does not apparently prevent such failures in the first place. If this reactive approach continues, then quality failures will continue unabated regardless of the statutory powers. There needs to be conscious change to regulatory practices to inform decisions to investigate, when to investigate and how to investigate. The Regulator must have powers to conduct investigation 'sua sponte' in addition to the disclosure requirements proposed in the Bill. The scope of the investigation must cover the activities of providers, and most importantly, their work outcomes. There must also be intentional regulatory practices to provide incentives to encourage the reporting and detection of issues to inform the investigations.

The existence of such arrangements could have enormous benefits including timely inspection of cases and detection and prevention of escalation and future recurrence. However, there will be a cost, and the FSR will need proper resourcing. The FSR perhaps has the potential to use its specialist working groups to better effect. Currently, the Forensic Pathology Specialist Group conducts the annual review of the work of Home Office-registered pathologists. In order to minimise the cost of establishment of a new body for investigation, the FSR could utilise the respective specialist groups to conduct investigations/inspections in their area of expertise. To make investigations robust, the provisions for investigations can also be linked to other aspects within the forensic science provision stream such as procurement conditions. The FSR will continue to be hampered if unable to scrutinise more closely the working of the 'marketplace' and contracting conditions.

10. What lessons can be learned from the use of forensic science in Scotland and Northern Ireland? What can be learned from the use of forensic science overseas?

In the USA, a notable regulatory feature among many varying state-wide forensic science oversight processes is a requirement for independent external investigations into allegations of malpractice within forensic science labs. This power is largely derived from a federal statute and works through federal funding programs, such as the Paul Coverdell Forensic Sciences Improvement Grants program. As a result, States can either create a new investigative entity or delegate an investigative authority to an existing external agency. For example, the Texas Forensic Science Commission has a permanent investigative panel selected from its commissioners who investigates all cases of negligence and misconduct in forensic science labs. The New York State Commission on Forensic Science has designated investigative roles to the State's Inspector General.

11. Is the 'Forensic Science Strategy' produced by the Home Office in 2016 suitable?

The Strategy contained very little beyond a series of fairly unambitious and uninspiring statements, focussed upon cost and regulation, with the focus quite clearly upon police-driven changes. There was a paucity of detail, no underlying principles, and a distinct lack of 'strategy'. In May 2018, the Science and Technology Committee's Fifth Report documented their frustration with governmental negligence in not producing a biometrics strategy, as well as the shortcomings of the Forensic Science Strategy. The strategy was two years late and found by the preceding Committee to be inadequate. The Committee now is urging that it be revised and re-evaluated, as weaknesses already identified are being exacerbated by the growing vulnerability of the private forensic market, and the lack of full accreditation of forensic service suppliers (most notably the police). The Committee stressed in particular the importance of creating a transparent and accountable regime for the forensic use of bioinformation that is simultaneously legally justifiable, socially acceptable and ethically sound, reiterating the core message of the Nuffield Council on Bioethics' 2007 report, *The forensic use of bioinformation: ethical issues*. While the Government has responded to issues concerning DNA and fingerprints, at present, the use of other biometrics, in particular, facial images, remains largely unregulated, with concerns about a lack of reliability with the questionable accuracy of technologies, and the potential for discriminatory bias. Forensic science developments cannot take place in a policy void. Such policy must be underpinned by considered debate, incorporating vital ethical concerns. A new, better strategy is the minimum that is currently required, particularly in light of rapid changes anticipated with the 'transforming forensics' programme (that remains largely opaque).

12. How should further research funding for forensic science be justified? What should be the focus of such research?

There is already much forensic science research being undertaken, largely in higher education (it is unclear how much is now undertaken by cost-conscious FSPs stretched to satisfy contracts that do not include costing for research and development). However, much of this remains inaccessible, and thus not utilised. Efforts are being made to address this (such as the 'research4justice' project) but such efforts need support. Universities need funding for forensic-related research (and dissemination), not only to apply directly to the criminal process, but also in order to maintain academic standards and train future generations of forensic science researchers. Producing forensic 'technicians' who can simply carry out tests may satisfy current police demands (and is cheap) but will lead the discipline of forensic science into a dead end very quickly. There has already been a massive loss of experience across the board and this impacts upon the ability of the discipline(s) to improve. The UK has already lost its international reputation for leading forensic science and this is only set to worsen if funding at higher education level is not increased.

13. Where are the gaps in research and understanding of forensic science? How and by whom should the research questions be articulated to fill these gaps?

A concern when leaving R&D to private companies, is that this research will focus upon 'new' products, designed to gain market-share or open new markets, instead of underpinning current disciplines with validation studies etc. Much research that is needed is to understand the reliability and robustness of current techniques. This is unattractive to a company that needs a 'return on investment'.

If a mantra were to be identified through all the reports on forensic science, it would be the need for 'more and better science'. Between forensic disciplines, the sophistication and maturity of the scientific underpinnings varies substantially. Demands for more research are necessarily coupled with demands for funding, a deficiency that seriously curtails opportunities to study forensic disciplines at graduate level, with universities discouraged, if not precluded, from developing research-based forensic programmes, particularly at doctorate level, as well as limiting the ability of forensic science to attract the best scientists. Indeed, forensic science education is a perennial issue, with familiar criticisms surfacing: inconsistent quality and insufficient funding. It should also be reiterated that research should often be multi- and inter-disciplinary, with research spanning disciplines, including law and the social sciences. Research should also be undertaken on issues faced by forensic science that arise outside of laboratories – so projects looking at crime scene analysis; evidence selection; legal interpretation and so on.

14. How can a culture of innovation in forensic science be developed and sustained?

The 2016 Report '*Forensic Science & Beyond*' by the then Government Chief Scientific Advisor rightly stated that: "*The future of FS will require close collaboration between a range of scientific disciplines, entrepreneurs and regulators. Importantly it will require strong public engagement leading to robust democratic decisions about the circumstances – the where, when and how – in which these powerful tools will be employed...*" Innovation requires multiple partners and the exploitation of new techniques must be accompanied by rigorous evaluation, which includes answering questions of both effectiveness and legitimacy. All of this must be undertaken within a broader context: "*We can only have the best discussion about innovations if we understand that the discussion must be about both science and values.*" (Government Chief Scientific Advisor, Annual Report 2015). 'Justice' in its broadest sense must always be paramount in any and all discussions surrounding forensic science.

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14 September 2018