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

Forensic science is providing a crucial role in delivering a support service for the police and the criminal justice system, without which our judiciary would be severely impaired. For instance, in analytical toxicology, laboratory analyses provide high quality evidence and the interpretation of such data by a range of experts to identify the perpetrators of a wide variety of crimes from bomb explosions to terrorists support a wide range of crime scene investigation, drink and drug driving offences and previously unsolved crimes.

The provision of objective, scientifically proven, rigorously delivered forensic evidence is a lynchpin in the pursuit of justice, without which there would be no criminal justice system. However, this contribution has been affected since 2010 by spending cuts and the faster, quicker, cheaper initiative, such that crimes are not being investigated forensically, or only minimally with a reduced number of exhibits being submitted and less time being given to any individual examination. The lack of funding for forensic science services nationally has led to police forces searching for the cheapest option rather than the most robust. The pursuit of a cost saving service has not been carried out in an evidence-based manner such that services and systems are susceptible to failure as has been the case with the Randox debacle.

There has been a lack of engagement with the forensic science service with regards to the level and extent of its contribution to the justice system. Developments in the sector appear to have been driven by financial targets and on initiatives to reduce the cost of the police instructing a provider. With the privatisation of the forensic provider the contribution of forensic science to the delivery of justice in the UK has considerably weakened. This is because forensic providers are commercialised companies and whilst competition in the provision should not be a disadvantage it has negatively impacted on the breadth and depth of the provision available to the police, e.g. the loss of trace and fibre analysis. The aim to make the provider more competitive in a shrinking cost market has led to different police forces having little choice but to use poor, sometime unaccredited, solutions.

In addition, limited legal aid funding means that forensic science scrutiny is sometimes lacking, and scientists are waiting for a challenge before assessing the evidence put before the court robustly (streamlined forensic reporting / appropriate examination of complex mixtures which might assist in exoneration). The outcome in many areas of forensic science is that its contribution to the delivery of justice in a less than optimal way.

An exception is forensic explosives analysis, this work is done almost exclusively on mainland UK by the Forensic Explosives Laboratory, (FEL) and therefore is not privatised like other fields in forensic science. Northern Ireland is catered for by Forensic Science Northern Ireland, as part of the Dept. Justice. FEL have recently invested heavily in high-assurance analytical platforms and are a recognised leader internationally in front-line forensic explosives analysis. There is not an emphasis on minimalistic forensic provision and FEL often operate a research-led approach, underpinned by a healthy R&D commitment including engagement
with academia and industry. However, economy of scale is currently underway. Closure of the Fort Halstead site where FEL is currently located, a merger with CAST and relocation to Porton Down has consolidated forensic provision in this area. There is an increased focus on throughput and investment has already been made to address it. This model could be considered for other areas of forensic science.

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

**Strengths**

The UK criminal justice system is renowned throughout the world for its rigour, transparency and high standards. It has been founded and maintained through an enviable accreditation system.

**Privatisation of forensic services** - The UK has a genuinely competitive market and consumers have access to a choice of suppliers. Competitiveness acts as an incentive for suppliers; they are all striving to provide the best services (in terms of timeliness and cost) and be successful in the consumers’ selection process. The competitive market has meant that providers have been able to provide quick turnaround times, keep costs low and streamline processes; taken together these achievements, from the managers’ perspective has resulted in improvements that are beneficial to the criminal justice system. The overall breadth and quality of forensic provision in the UK is good and standards are high.

**The Forensic Regulator** and the quality control system ensures that the standard of analysis is generally good and fit for purpose: The DNA database and the independent ethics board are hugely important. The British Association of Forensic Science seeks to ‘encourage study, improve practice, disseminate information, and advance knowledge in forensic science and forensic medicine for public benefit’ and the Chartered Society of Forensic Sciences acts as the professional body representing forensic scientists in the UK and they are also responsible for accrediting higher education programmes of study. These two charities, together, aim to ensure that forensic professionals are provided with opportunities for their professional development.

**Databases** such as IDENT1 and DNA databases cover larger per capita populations than many other countries.

**Weaknesses**

**Forensic regulation** has no statutory basis. This lack of oversight is a weakness: quality is not always embraced, experts who have been criticised continue to appear in court, scientific evidence often misconstrued and, the level of training in the judiciary is variable. The Forensic Regulator needs the authority to address these issues and ISO 17025 accreditation is not sufficient (or not being sufficiently enforced), for example the Randox enquiry. The practice of pseudo-validation of methods through live casework track records should be more clearly controlled.

**Financial restrictions**: a privatised system driven by profit and throughput does not ensure quality and has meant, for example, that police forces are trying
to undertake more in-house examinations; however, they do not necessarily work to the same accreditation standards as providers and this can undermine both the quality and the objectivity of the analyses. There is too much financial pressure to deliver high quality results at low cost, i.e. quality and cost are inversely proportional. Turnaround time and efficiency of services are seen as critical factors. However, the impact that faster turnaround times and spending cuts might have on quality needs to be closely evaluated.

**Lack of appropriately qualified and experienced forensic scientists.** There is currently a lack of scientific understanding in many forensic laboratories. Employees are increasingly expected to follow a protocol; are poorly paid; work shifts and have limited understanding of the forensic process or a real commitment to their work in criminal justice – ‘it is just a job’. Often reporting officers are not sufficiently well trained and reporting is not evidence-based; this can cause confusion and at worse, a miscarriage of justice. Additionally, the experts in court are variably trained in providing forensic evidence is sometimes a weakness. There is also a lack of court-going staff because of an insufficient pool of appropriately trained upcoming staff. At present, even if laboratories employ an MSc graduate in forensic science/toxicology or analytical toxicology, the employee should ideally spend time in the laboratory, as well as being a reporting scientist. This adds to their understanding of the science they are reporting but inevitably takes time and adds to an organisation’s training costs.

**Limited research, development and innovation.** There are no discernible, reliable, ongoing sources of funding for forensic science. For instance, research to improve police choice of exhibits has not been carried out. It is recommended that there are national calls for research in key strategic areas funded by a peer review system. Instead it appears that expensive solutions being used to reduce custody time (rapid DNA).

**Understanding and use of Forensic Science in the Criminal Justice System**

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?**

The scientific evidence base is generally strong although the movement of CAST (Centre for Applied science and Technology) to Porton Down and the loss of their stream of funding for analytical research will impact on the provision of evidence-based technology in certain areas going forward. For drug and alcohol driving offences the introduction of state-of-the-art equipment (breathalysers with variable cut-offs; 3 and 5 strip immunoassay drug screening tests) have been hampered by a complicated type-approval process and a lack of research funding to investigate the usefulness of such equipment in the UK context. We stand out as an important contributor to the global debate on drink/drug driving because we do not conduct scientific analytical drink/drug driving research. In the United States, Scandinavia, Europe and Australasia research of this nature is funded by the government.

In terms of routine analysis this tends to be done very well and the Regulator’s role assists in this, ensuring that the scientific evidence is robust. However, there should be scoping to explore the use of more sophisticated techniques. Nationally
we should be able to assess the usefulness of NMR for example, but there is neither the time nor the resources to do this within a service-facing system.

Our evidence base and understanding of assay uncertainty is weak and needs explaining in a variety of different media. Much of the uncertainty data/laboratory practice in routine use today is based on work carried out on obsolete equipment. Uncertainty, and its role in helping to deliver justice, should be made more transparent and robustly justified.

With the explosion in use of recreational drugs, gaps have developed in our knowledge. The forensic and toxicological evidence base is variable. Cases are more complicated, generally involving a multiplicity of drugs rather than a single substance. The increasing use of novel psychoactive substances (NSP) including synthetic opioids and synthetic cannabinoids has challenged forensic providers analytically. This is matched by a lack of scientific knowledge about pharmacokinetic and pharmacodynamic parameters for these compounds, including their toxicity and limits, and what can reliably be used in evidence.

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?

A comprehensive national programme of education and training is needed for all those involved in the criminal justice system that covers for example, but not limited to the importance of gathering and preserving evidence; the importance of the chain of custody process and; the importance of safeguarding and storage of evidence. To achieve this a time-limited National Panel should be established with membership inclusive of the key stake holders (scientists; lawyers and the judiciary), and also including relevant professional bodies, the Forensic Regulator, the probation service and the prison service etc.

It is imperative that discussions take place between forensic scientists and criminal lawyers so that evidence is communicated in a way that enables sufficient scrutiny by having different stakeholders have a clear understanding of the findings (Regan, 2017). There should be opportunities for effective communications to take place as a case progresses through court. A review of the impact that the changes to legal aid have had on delivering justice should be held. Two actions should be implemented to address the weaknesses in the current forensic science model: 1) introduction of statutory power to the Forensic Science Regulator and 2) establish a viable funding model to address key strategically driven research questions.

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?

There is poor comprehension within the criminal justice system. There appears to be variable understanding of forensic evidence in general, localised practice that is not evidence-based in some and inconsistent behaviour in others. For instance, the judiciary do not always appreciate that the presence of a DNA profile does not necessarily mean that an individual must be guilty of a crime. Bespoke educational packages are required for different professional groups to bring them all to a minimal acceptable standard. For example, executive education for
judges; criminal barristers and police officers should be linked to mandatory professional development. A programme of training should be delivered by an accredited educational provider.

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

**No.** The closure of the FSS in 2010 followed by the commercialisation of forensic science service provision has resulted in insufficient graduates entering the profession to keep the UK in its leading position; a problem that was identified in the HM Government commissioned Silverman Review (2011). Education and training for police officers and the criminal justice system appears patchy nationally and has not been successful in enhancing the status of the judicial system overall. In many cases there is a lack of understanding of the importance of professional development to keep the workforce up-to-date with forensic science as it evolves; be that the latest analytical test or advances in technology. Some consolidated effort is required here to make training attractive (developed by experts in the field) and rewarding (incentivised). There should be a goal to establish enough educated decision makers, both in the police forces and in the legal system, to ensure that forensic science training is embedded within these professions.

Basic training for both the police officer and the lawyer should include the basic tenets of forensic science. This is not about training them as scientists but about the acquisition of general forensic knowledge and how that knowledge should be applied scientifically in court. In Higher Education today and certainly at King’s College, education is delivered in different formats (classroom; online; blended) and methods (summer school; MOOC; short-course; certificate; diploma; degree) to accommodate a wide range of needs and appropriate educational courses can be developed to suit the relevant professional group.

**Standards and regulation**

5. **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?**

**No.** The forensic providers are generally doing what they are asked to do but they are limited by limited market rates of pay. **Yes.** Changes are needed. A strategic position is required to effect some control over the market to ensure the provision of the service is fit-for-purpose. We have already seen the closure of many small forensic providers and ongoing mergers have resulted in large providers seeking to trim processes to cut costs. There is clearly a problem when costs are drastically cut to win business at the cost of falling quality. Contracts, won or lost, can put a provider under significant stress. At present there seem too few providers to operate an open market approach without risking a fall in standards of evidence and quality assurance. This in turn will reduce the capacity to deliver justice effectively in the UK.

6. **Is the system of accreditation working successfully to ensure standardised results and the highest quality analysis and interpretation of significance of evidence?**
Generally, UKAS does a very good job in ensuring high quality but this does not always prevent problems. Quality is aided by the Forensic Regulator’s guidance however, accreditation is too expensive for small organisations; regardless of the size of an organisation the scrutiny of a process needs to be the same, but it would be more equitable if the costs were related to the turnover of the organisation.

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

We believe that the Regulator should be statutory and s/he able to demand specific quality standards.

8. **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?**

The quality of work is often much better in the UK, in comparison with provision overseas. This is partly driven by an adversarial system with its higher level of scrutiny and more robust accreditation, but this is at risk in a culture of reduced legal aid. Notable exceptions include the Norwegian service and the Netherlands, both of whom thrive on a symbiotic relationship between themselves, their governments and academia.

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

**No.** Although well intended, the aim to make Forensic Science services more effective with increased efficiency at lower cost is no longer suitable. This approach often looks good on paper but does not work in practice. For instance, increased governance and increased ethical oversight has achieved greater integrity and equity but overall effectiveness is at risk because of the drive to reduce costs. Although there has been greater focus on digital forensics this is taking place slowly and inconsistently.

Today the forensic science providers (FSPs) acknowledge that their research and development (R&D) is concentrated on maintaining the quality of the routine service and reducing the cost of analysis in order to win contacts and keep themselves afloat. Academic opportunities are limited. The Silverman Report in 2013 criticised the lack of research and the Forensic Science Strategy has not addressed this shortfall: research is currently market rather than science driven.

**Forensic Science research landscape**

10. **How should further research funding for forensic science be justified? What should be the focus of such research? What is the role of UK Research and Innovation, especially considering the interdisciplinary nature of much forensic science?**

Before a rationale can be delivered the current misunderstanding of the value of R&D needs to be resolved. For instance, clarity should be provided on who is responsible for providing R&D, who translates it into practice and where
innovation fits in. Many practitioners feel that innovation lies beyond their remit (i.e. that R&D = innovation) and therefore lies with universities. Justification should be strategically driven: linked to delivering a state-of-the art justice system.

The focus should be on an integrated approach partnering academia, forensic provider and end user. The role of the UKRI cannot be the only solution to research funding for forensic science. For example, UKRI Responsive Mode, does not sit well with practitioners who often review proposals (and judge based on benefits to their service). This innovation driven funding approach is valuable, but needs to be integrated as part of a wider funding stream.

Interdisciplinarity should be seen as a strength of forensic science and not a weakness. The provision of translational research (laboratory to end-user) enables research questions to be answered more quickly and in a more comprehensice manner. This should be the lynchpin of research funding for forensic science. Currently, research is being delivered through BSc/MSc project students or self-funded PhD students. This is not appropriate if forensic science research is to be of benefit to criminal justice. Forensic Science needs a dedicated programme funding. In the UK we regularly see our ideas being funded by other governments because there is a lack of funding here.

11. 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?

There have been initiatives to map needs and offer advice and get stakeholders together, but this has been difficult to sustain in the absence of financial support. Unlike many other European countries, there is no specifically funded research for forensic science. The UK R&I could take that role, but now it just seems to be an umbrella allowing cross fertilisation between the different research councils in what they already cover, rather than addressing forensic science directly. The gaps include research:

Investigating novel approaches to biological evidence detection and analysis (body fluids, fingerprints and DNA). For example, development of biosensors could revolutionise the way a large amount of forensic analysis is carried out.

Developing tools in forensic science that are applicable for use at a trace-level, and in significantly degraded samples, so that the result is suitable for implementation in a legal framework; improving genetic-based phenotypic prediction of visible characteristics, age and geographical ancestry; utilising massively parallel sequencing to disentangle complex DNA mixtures, regularly found at a crime scene.

Exploiting the rapid technological advances in analytical chemistry which will improve the quality, speed, use and understanding of evidence in drug-related crime and facilitate its integration within the legal system through application of best practice, education and training, thereby providing the mechanism to assist the criminal justice system.

Integrating solutions to operationally-relevant problems for chemical hazard/threat detection in the environment such as early warning devices for explosives detection in air; novel semi-targeted analytical methods for
identification of new chemical hazards in the environment; combined fingermark enhancement and DNA recovery methods

**Developing** solutions to cybercrime and digital forensics, one of the fastest expanding international problems.

**Delivering** experiential learning in the capture of large bodies of interrelated evidence and data to develop evidential reasoning in the courtroom

**Supporting National initiatives** such as the Wildlife Crime Policing Strategy and the Rural Affair’s Strategy by growing wildlife crime forensics. Poaching in particular comprises the fourth largest global illegal trade after narcotics, counterfeiting of products and human trafficking and funds international terrorism.

We would endorse the need for partnerships (academia, forensic provider and end user) as the basis for research funding because this has the potential to leverage greater benefits and these groups working alone. However, investment should be longer term and encourage sustainability.

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

Development of innovative solutions rely on ideas that are practical and have some established evidence base. Blue sky R&D is not underpinning the entry point to the pipeline for forensic science innovation. Such work is generally adapted from other disciplines rather than having a forensic root and therefore fitness for purpose assessment is much slower. In this way, innovation is not sustainable and is rather stagnant.

Forensic science needs to invest in communication strategies that introduce a more receptive environment for the introduction of new ideas, even to exclude them as potentially better solutions to existing ones. Part of this problem lies with the market led approach to the service as well as those who fund R&D. Higher risk forensic science R&D is lacking in the UK especially in terms of novelty and exploratory science. Funding bodies who invite forensic practitioners to review proposals do not recognise that there is a reticence/lack of vision for the value of new ideas that are not directly relevant to their own specific field, which causes them to often fail at this stage. A dedicated forensic funding stream should address this.

The government should consider the establishment of Forensic Science Research Centres that are defined by scientific excellence in one or several forensic subjects that are tasked with leading the field and informing the delivery of justice in the UK. Such centres should celebrate (demand) interdisciplinarity and be funded in 5-year blocks to mirror MRC centres.

15. **Are there current or anticipated skills gaps? Who should have responsibility for and/or have oversight of training?**

More literacy at a fundamental level is required regarding artificial intelligence/machine learning for forensic scientists from core scientific backgrounds (e.g. biology/chemistry). Many analytical platforms are now becoming 'full data-capture' in nature. Traditional targeted analysis is changing,
and we need to adapt more quickly to cope with the scale of data and to identify/harness its forensic value. This is also something that can help ‘future-proof’ forensic analysis against new substances that may be encountered in criminal investigation, for example, to help identify new explosives threats, novel psychoactive substances, or enable a deeper interpretation of genetic information for phenotyping, etc. Universities are likely to be well suited to provide this, but industry should be integral to ensure that practical front-line problems are identified and particularly to focus its responsible application in a forensic context.

In forensic genetics there are opportunities to benefit from bioinformatics but again this is an area that is focussed on genomic medicine and the ability to work across disciplines is somewhat limited. There are good higher degree courses in the UK in forensic science and many of the graduates enter the forensic industry, but funding for PhD studentships is more limited and often is in competition with other more high-profile subjects within a university, if funding is internal to the organisation.

**Digital Forensics**

16. Are there gaps in the current evidence base for digital evidence detection, recovery, integrity, storage and interpretation?

17. Is enough being done to prepare for the increasing role that digital forensics will have in the future? Does the Criminal Justice System have the capacity to deal with the increased evidence load that digital forensics generates?

Police are currently spending more money on digital forensics than traditional sciences, this has been interpreted as meaning that traditional sciences are being neglected.

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