Northumbria University Forensic Science Unit Research Interest Group – Written evidence (FRS0050)

This submission is made on behalf of Northumbria University Forensic Science Unit, a group of nine academic staff from the UK, Switzerland and Italy with an extensive interdisciplinary research and publication record, supported by professional experience from the Forensic Science Service, LGC, the Scottish forensic laboratory system, the East Midlands Pathology Service and Sheffield Medico-Legal Centre.

This submission is intended to offer a science-facing complement to the law-facing submission made by the Northumbria University Science and Justice Research Interest Group, with whom we collaborate in cross-disciplinary work.

1. Is forensic science contributing to the delivery of justice in the UK?
   1.1. Forensic science is essential to the delivery of justice where physical evidence is the arbiter of truth, with regard to identification, events, and the reliability of witnesses, complainant, and accused. The wider principle, going back to Magna Carta, was aptly stated by the Honourable Peter Cory (Supreme Court of Canada) in the Inquiry following a wrongful conviction and incarceration of Thomas Sophonow for murder in Manitoba:

   “we must be sure that the deprivation of that fundamental liberty [the bedrock of democracy] is appropriate and is demonstrated beyond a reasonable doubt on evidence that is fair and a process that is fair” [1]

2. What are the current strengths and weaknesses of forensic science in support of justice?
   2.1. In brief, the vast majority of cases involving forensic science pass through the justice system uneventfully, despite a reduction in resources and contraction in the field. This indicates that, in England and Wales, changes related to the introduction of a forensic science marketplace, including charging regimes and Streamlined Forensic Reporting (SFR), have yielded significant efficiency savings. Conversely, there are real indicators of significant risk of collapse. The closure of Key Forensic Services Limited and the Randox scandal, for example, have fundamental implications for the stability of the marketplace and for the integrity of high volumes of cases in the criminal—and, in the latter case, civil—justice systems. Finally, a series of judicial and parliamentary inquiries conducted over several decades indicate ongoing policy neglect in forensic science and medicine.

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?
   3.1. The scientific evidence base for use in investigation, prosecution and defence varies widely. There is a strong theoretical, statistical and empirical basis in forensic genetics and in the analytical sciences—such as materials, chemistry and toxicology. There is a diminishing evidence base, however, in comparative examination methods. Gaps have been identified in previous inquiries, of which the most detailed and extensive is the report of the US National Academies of Sciences (NAS) [2]. This report draws particular
attention to the weak evidence base in the comparative disciplines. The US President’s Council of Advisors on Science and Technology (PCAST) report [3], goes into further detail regarding deficiencies in complex DNA mixture comparison, as well as bitemark, fingerprint, firearm, footwear and hair comparison, and notes the significance of cognitive bias as an impediment to interpretation. Gaps affecting novel psychoactive substances, and digital and image forensic evidence have grown since these reports were produced.

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?**

4.1. A perfect end-point is a Utopian expectation. As culture, technology and scientific knowledge evolve, so forensic science must adapt. While forensic science provision will remain a ‘work-in-progress’, a number of key principles so far identified include improved standardisation, accreditation and education; measurement of performance and error; consistency in terminology and reporting; independence from or autonomy within the law enforcement community—including removal of all forensic facilities from control of police and prosecutors; establishment of robust quality assurance and quality control procedures; automation; introduction and enforcement of a code of ethics; recruitment of students in the physical and life sciences to pursue graduate studies in multidisciplinary fields critical to forensic science; improvements in medico-legal death investigation and automated fingerprint identification, and collaboration in disaster and counter-terrorism preparedness [2].

4.2. Scientists, lawyers and the judiciary tend to operate in ‘silos’ Activities that foster communication, at all levels and from an early stage in education and training would help avoid misunderstandings and misconceptions. Forensic science is a field of multidisciplinary research and practice, involving public and private practitioners; lawyers and the judiciary; and research, education and training. A forensic science that is ‘robust, accurate and transparent’ will require the involvement of all sectors. Following the primary recommendation in the NAS report, a “National Committee” is required to broker the needs of the contributing parties in the public interest.

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?**

5.1. Whilst the NAS report [2] firmly argues that it is the forensic science community that needs to improve, as “judges and lawyers generally lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner”, it also recommends support for “law school administrators and judicial education organizations in establishing continuing legal education programs for law students, practitioners, and judges”. Training at undergraduate and postgraduate level, and continuing professional development are all likely to improve understanding. In the UK, the introduction of primers [4] represents a positive step in improving communication between science, lawyers and judiciary. Arguably, such documents would benefit from becoming ‘living documents’ that can be
readily amended to reflect the state of current knowledge and informed dispute. The related Science and Justice Forum advancing communication between the judiciary and Royal Society is a further positive development and an instance of leadership by example ‘from the top’.

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

6.1. There is no suggestion that in-house training in forensic science for forensic science practitioner organisations is inadequate. The situation in the police sector may be variable by region, as may be the level of training available to smaller groups of practitioners and individuals. The need to develop understanding of forensic science amongst lawyers is widely accepted, however, in the UK [4] as it is in the USA [2].

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?**

7.1. There are serious indicators of a risk of a collapse in the current market. Another major provider leaving the market could prevent adequate provision of examinations, tests and reports. Similarly, further scandals affecting high profile or volume crime investigations could further undermine public confidence in the justice system.

7.2. Forensic science provision is a component of the justice system, long recognised as a primary responsibility of government. When the 18th Century economist Adam Smith [5] was writing, there was no police or prosecution service. Prosecution for theft—stealing of valuable pocket watches¹, for example—was undertaken privately and was relatively accessible (although not so a defence). Government has since grown to incorporate policing, a legal defence, a prosecution service, and—from an early stage in its development— forensic science [6, 7]. Suspect and complainant do not ‘pay for their own’ forensics.

7.3. A trend in policy of recent governments has been to attempt to reverse this process, including—in particular—by moving the government Forensic Science Service (FSS) to GovCo status and introduce a market for forensic services. These policies are referred to as ‘neoliberal’. The current forensic market is not liberal, however. The price is controlled by the police via the Home Office, making the market not just unattractive, but possibly unviable, and risks or is undermining the investigative process. As one of us argued five years ago:

“At the moment, the situation where the police services can act as customers and competitors, and in a sense via the Home Office they are also the arbiters, looks like a model for disaster” [8]

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¹ The pocket watch was the first example of a valuable commodity and one subject to theft, which fell rapidly in price due to mass production and technological progress. A situation that continues to have parallels today—e.g. to high-end ‘smart phones’.
7.4. The forensic science market is not a free market economically, but one brokered by the state between the police and private sector companies—other public-private partnership have ended badly. It may be wrong to wait until the point of collapse before taking action. How near we are to that point remains uncertain, but as one of us has argued, “if the government want a viable market, they can have one”—via a public or private route [8].

7.5. An imperfect market, however, may be better than imperfect government control—as the fate of the FSS and subsequent events imply, and a return to the police service would result in a loss of independence contrary to the key principles identified above [2]. An alternative could be a system of regional licenced services overseen independently of the Home Office [8], and funded to a level that would make the market economically attractive to private providers—as well as public organisations—ensuring a necessary level of funding to support training and professional development, accreditation, industrially-led research and fully regulated defence casework. This could be achieved by top-slicing the current police, CPS and legal aid budgets to an amount commensurate with current funding of forensic science and medicine, plus an apportionment to support the costs of licencing and regulation, accreditation, and some aspects of research, education and training.

7.6. Issues affecting quality are not a simple consequence of privatisation, as they happen whatever the type of provision [9]. While privatisation has produced cost-efficiency savings for the police, the commodification that has accompanied it has introduced risks that could compromise proper investigation in the interests of the justice system overall [10].

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

8.1. The Forensic Science Regulator has completed a prolific amount of diligent and constructive work in seeking to ensure providers comply with detailed codes of practice and accreditation standards. While some organisations have yet to comply and more standards are being developed, there has been considerable progress.

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

9.1. The Regulator’s current role of developing standards and and ensuring compliance, dealing with complaints, and disseminating good practice is unique and valuable. The Regulator’s role in chairing the Home Office Forensic Science Advisory Council is similarly important. This is a plausible leadership body with independence from the police and prosecution, but without a prevailing role in policy formulation—in service provision or in research, education and training.

9.2. With certain caveats [9], it is difficult to argue against regulation. The most significant concerns are that regulation will squeeze out those experts—

2 A Faustian bargain?
critical to justice in an adversarial system—responding to defence instructions, as well increasing risks to market viability in general by introducing a further cost of doing business. If statutory powers are to be introduced, these could allow the Regulator—following a fair investigative procedure and opportunity for remedy—to prevent a non-complaint expert or organisation from offering services to the justice system (including, potentially, a method such as by revoking a licence, as discussed above).

9.3. The significance of the Randox case to the Family Justice System highlights the neglect of forensic science standards in the family courts, which include such issues as the scientific components of psychology and digital forensics, as well as in forensic science as traditionally conceived. The Family Courts arguably have greater impact on many people than the Criminal Justice System, and this lack of expert oversight and regulation may be a matter of particular public concern.

9.4. There would be considerable value in exploring moving the Regulator’s unit out of the Home Office into a non-ministerial unit—“OfFor”—as a route to delivering and funding licencing and regulation via policies favouring the justice system as a whole—police, providers, lawyers and judiciary in both the criminal and civil courts.

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?

10.1. There is value in comparing models for forensic science service delivery in other jurisdictions. Those of Scotland and Northern Ireland are not directly subject to privatisation, but are affected where there is pressure from the police services to align practices adopted in England and Wales—e.g. to link procurement to value for money. However, as FSNI Director Stan Brown has pointed out:

“there are two very different customers for any forensic science provider; the police, who want fast, low cost support to their investigation and the Courts, who are inherently cost-blind and want very robust, independent and objective expert witness in support of justice, whether that means conviction or acquittal for the accused” [10]

10.2. Similarly, lack of a mechanism to regulate supply and demand can expose the provider to careless and excessive submissions of evidence for examination. Somewhat privatised systems are also offered in Western Australia and New Zealand. In the latter case, ESR [11], there is an expectation of a certain level of outturn or profit on turnover incorporating service provision within New Zealand and international revenues, with a strong element of research. It may inform a model for a regional licenced service as discussed above.


11.1. The House of Commons Science and Technology Select Committee criticised the Strategy, noting its lack of coherent vision and route to
delivery, and asking “whether the Forensics Strategy is a strategy at all” [12].

12. 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?

12.1. In addition to the calls for further research in the NAS [2] and PCAST [3] reports above, numerous UK parliamentary and judicial enquiries have called for research in and on forensic science. A recent paper addressing UK forensic science policy and University research audits [13], recounts calls for research in forensic science in the House of Commons Home Affairs Committee Report of 1989, the Runciman Report of 1993, the Home Office Science and Technology Committee Reports of 2010-12 and 2016-17, the Silverman Review of 2011, and the Leveson Review of 2015. This list is not exhaustive. These reports call for:

“research to ensure services were cost-effective, adequately funded and staffed, operationally efficient, and organised to match caseloads; to encourage the development of expertise and centres of excellence, embracing applied research, in the Universities as well as in public sector and commercial laboratories; and to establish the validity of the forensic sciences... ...a national research budget for forensic science; greater involvement of forensic scientists in REF research impact assessment and the establishment of forensic science as a strategic priority for the Research Councils” [13]

12.2. UKRI has the potential to facilitate research in forensic science. The Chief Executive, Sir Mark Walport, delivered a substantial report [14] on the condition of forensic science research in his recent role as Chief Scientific Advisor. Noting the highly interdisciplinary nature of forensic science, the report reviewed a broad range of activities beyond the traditional scope of the forensic sciences, suggesting forensic scientists should seek broader applications for their methods—for example, in cyber, food or environmental security. Although pragmatic and forward-thinking, this strategy is not focused on meeting the need to fill gaps identified above.

12.3. It is a misunderstanding to think UKRI should provide a forensic science research budget. UKRI competitively funds quality research and innovation, so the question is how forensic science can leverage awards, especially given its unique and multidisciplinary nature. A multifaceted approach is required (see below).

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?

13.1. The gaps identified in the NAS [2] and PCAST [3] reports offer plausible starting points. The UK parliamentary and judicial reports also note the importance of socioeconomic and policy questions that underpin problems in forensic science that have persisted for decades [13]. There may be many cases in the comparative disciplines, as well as generally in the interpretation of the evidential meaning scientific facts and where newly-
developed methods are involved, where the expert cannot speak definitively. This may not mean that the expert’s evidence is not helpful to the court, as it may be more informed than a lay person’s view or it may signify an advancement on existing practice. In such cases, the quality of the evidence may be advanced by new research.

13.2. It would be unwise to be overly prescriptive in mandating foci for research a priori. Forensic science is a moving target, especially as crime follows developments in culture and technology. Innovation in science and technology evolves in a similar way. A multi-pronged solution is the only one likely to bear fruit in the medium and long term. Such a solution must include 1) University-led research targeted at UKRI funding, 2) independent research by public and private sector providers, and 3) cross-sectoral collaborative endeavours aimed at product and service innovation and technology transfer to the marketplace.

13.3. Although there is a respectable volume of research in forensic science conducted in the Universities [13-15], these efforts are rarely considered quality research according the government’s successive audits—most recently RAE 2008 and REF 2014. Forensic science is unique in its absence in not having a locus in these exercises. As the ‘REF’ is a major strategic driver of University investment in research infrastructure and quality research staff, and a major source of research income for Universities making successful submissions, this is greatly to the detriment of forensic science. While there are plans to include an optional identifier of forensic science research in the next exercise—REF 2021—forensic science will still not be included as part of a Unit of Assessment (UOA). This proposed approach—again, unique in the exercise—will not give detail at the Institutional and subject level, and is not mandatory. It will not be possible to establish where and in what any quality forensic science research is being undertaken. The major strategic impediment to the development of University research in forensic science will remain, especially in institutions focused on research quality [13].

13.4. An immediate remedy would be to invite Research England (UKRI), who are administering REF 2021, to introduce a mechanism to ensure all forensic science research is ‘tagged’ with the identifier and that quality profiles be provided at a level—at least by Institution within Main Panel, if not by UOA—that will allow research quality in forensic science to be identified. In this way, University managers will be able to see the contribution of quality forensic science research to their Institution’s standing and income. Academically-led forensic science research is essential, as the Universities conduct the majority of research in the UK—including in forensic science [13], and because Universities offer a sustainable path to and pillar of a culture of innovation discussed below.

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3 A pragmatic proposal widely supported by programmes accredited by the Chartered Society of Forensic Sciences to combine with Archaeology was not taken up by HEFCE

4 A philanthropically-supported University Institute for Forensic Research at a top-tier (Russell Group) University would be an enormous boon to forensic science and medicine
13.5. Industrially-led research is also necessary to ensure sufficient innovation is targeted directly at meeting the business needs of forensic science service providers.

13.6. While the framework governing the forensic market is intended to ensure providers conduct research, published output has fallen in recent years relative to the University sector and the share delivered by the FSS has not been picked up by other providers [13]. If the granting of a right of a company to provide services in forensic science stipulates a requirement to conduct research, then compliance needs to be monitored.

13.7. There is already commendable work being undertaken to advance regional University-Industry collaborative partnerships and networks. These include the Scottish Institute for Policing Research (SIPR), the Forensic Science Investigation and Technology Information Network (FIT-IN) and other similar networks, and the Research4Justice student research database. These latter networks are particularly constructive in that they are allowing many ex-practitioners with valuable casework experience recruited into the former Polytechnics in recent years to begin to develop a research and innovation portfolio in partnership with police and providers.

13.8. The Chartered Society of Forensic Sciences and the Association of Forensic Science Providers (AFSP) also support collaborative research within their remits. There is or was a Special Interest Group (SIG) in Forensic Science, delivered via the Technology Strategy Board, targeted at promoting innovation and technology transfer. It is not clear what tangible deliverables this group has produced. The College of Policing also conduct research, but their publications webpage presently lists no publications under ‘forensics and evidence gathering’ [16].

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

14.1. A “National Committee for Forensic Science and Medicine” would help facilitate and coordinate many research and innovation activities, whilst permitting entrepreneurial research activity to continue without interference. Channelling funds and restricting research activity to a single entity would be uncompetitive and risky5.

14.2. Forensic science needs a research and innovation culture needs to be fostered that can flourish in the medium and long term—involving the Universities, public and private providers, and collaborative networks, as described above. Such an Institute would as an umbrella, attending to the interests of all parties.

14.3. Much like the policing sector, the forensic science sector needs to move from a “loyalty culture” to a “merit culture” [16]. A National Committee

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5 The FSS was recognised as world-leader in forensic research producing a significant proportion of UK-affiliated publications [13] with a few individual’s work particularly highly cited. The FSS was the key beneficiary of government-funded research, however, and was arguably not as productive as other agencies operating on more limited resources, but in a competitive research environment. At its closure, the Intellectual Property developed by the FSS was of limited value and the funding stream was lost.
would help foster a pluralistic culture that is evidence based and meritocratic, within which creativity and innovation are able to flourish. Such a Committee could formulate and commission research in policy, in a situation less vulnerable to sectional interest in policy development [17].

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

15.1. There seems to be a persistent shortage of firearms examiners and there is some risk that less-frequently used skills—such as blood pattern analysis and textile fibre comparison—could disappear. A core of experienced staff able to pass on skills and—especially—case experience would be invaluable.

15.2. Education and training is a complex problem as different levels of understanding and skill are required for different roles, with corresponding educational attainment standards ranging from 'A' levels to PhD accompanied by an inevitable need for mentored learning 'on the job'.

15.3. There is scope for more quality education and training at the Further Education level. In Higher Education, as well as developing research in the former Polytechnics, there is a need to encourage or enable greater involvement of top-tier Universities—via REF visibility—as this is where most quality research is undertaken.

15.4. The proposed Institute could offer oversight of training and education, and complementary R&D work, at the same time being informed by and informing the activities of the Regulator or—suggested—"OfFor".

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

16.1. The backlog in the analysis of digital evidence suggests there is a current lack of sufficient expertise available in this area and—given the proliferation of digital sources of various kinds—this gap may persist or grow.

16.2. There is a clear gap in capacity to collect and meaningfully analyse communications form social media, texts, emails and other sources, particularly in cases where there is no other evidence to distinguish between the events as adduced by complainant and accused. In these cases, digital evidence may be the sole arbiter of events, and of the reliability of parties. Such evidence is of critical importance in crimes of particular public concern—such as sexual assault complaints, but may be of equal value in many other types of crime.

16.3. Recent such cases have highlighted difficulties encountered relating to the collection, disclosure and use of forensic evidence. Some protection of the expert and expert’s role in cases of ‘moral panic’ may be necessary to ensure forensic evidence is properly collected and fairly employed in order to avoid miscarriages of justice.

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?**
17.1. From an academic perspective, digital / cyber forensics seems almost limitlessly diverse, encompassing a range of devices including cell phones, tablets, laptops, PCs, IT networks, GPS in cars, phones and other devices; cell site analysis; RFID tracking; wearable devices, CCTV and other digital image sources; image analysis; the Internet; public and private networks; digital communications by email, audio and VOIP; social media; identity theft; financial fraud; cyber-attacks; the Cloud; the Dark Web and so on. While it seems impossible to prescribe a policy that can adequately accommodate these areas and any detailed policy would be rendered quickly redundant by technological progress, oversight and regulation would be a further role of the proposed “National Committee” and Regulator—or “OfFor”, respectively.

References
5. “...every state or commonwealth endeavours...to employ the force of the society to restrain those who are subject to its authority, from hurting or disturbing the happiness of one another.” Adam Smith, The Theory of Moral Sentiments, 1795. http://assets.cambridge.org/97805215/91508/sample/9780521591508ws.pdf


16. For illustration, two economists discuss the detrimental impact of "loyalty culture" compared with meritocracy on business efficiency at a national level in Italy: Pellegrino, B., Zingales, L. (2017), Diagnosing the Italian Disease [PDF]

17. Actors involved in policy formulation all tend to act in "enlightened self-interest", as summarised in Butler, E. Public Choice – A Primer. Institute of Economic Affairs, London UK, 2012 [PDF]. An issue in forensic science and medicine policy is that there is no oversight on behalf of the public interest. A "National Committee" could over such oversight.

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