Professor Wolfram Meier-Augenstein – Written evidence (FRS0032)

Q1: Forensic science is not only contributing to the delivery of justice in the UK but is essential to the delivery of justice in the UK.

Q4: Service provision of the Criminal Justice System with forensic science should be lie with a service provider that is an integral part of the state's executive like the police and the courts.

A good example of what channels of communication are needed is the Leverhulme Research Centre for Forensic Science. Its aims include to raise the standards of current forensic science used in UK courts and to communicate forensic science correctly and appropriately. 
https://www.dundee.ac.uk/leverhulme/

Q5: The level of understanding of forensic science, and science in general seems quite poor within all parties of the Criminal Justice System. This is not a reflection of the people involved but a reflection of how science is taught and what emphasis is placed on science education in school.

As part of their professional development it should be compulsory for judges and lawyers to attend training courses dealing with aspects germane to both natural science and forensic science namely, measurement uncertainty (and its inevitability), the difference between accuracy and precision, statistical significance, the meaning of probabilistic determinations or conclusions to name but a few.

Conversely, forensic scientists and expert witnesses in a highly specialised subject of forensic science should attend training courses on effective communication of forensic science based evidence.

The work of the aforementioned Leverhulme Research Centre for Forensic Science is one example how understanding of forensic science can be improved amongst stake holders of the Criminal Justice System. 
https://www.dundee.ac.uk/leverhulme/

Another example would be the UCL Jill Dando Institute of Security and Crime Science which offers a number of continuing professional development short courses aimed at stake holders in the Criminal Justice System. 
https://www.ucl.ac.uk/jill-dando-institute

Q7: To ensure forensic science service provision is maintained if not guaranteed, England and Wales should not be in a position to be reliant exclusively on services by commercial businesses, especially not foreign owned commercial businesses.

Q8: What system of accreditation does this question refer to? I am not aware of any ISO standard of accreditation that would award accreditation for interpretation of evidence or determination of significance of evidence. Accreditation of (forensic) analytical laboratories is based on ISO17025:2005.
This is an accreditation standard for aspects of analytical work such as sample preparation, methods of sample analysis, maintenance of analytical instrumentation etc. with the main focus being on standard operation procedures and meticulous record keeping. The scope of ISO17025:2005 does not necessarily result in "standardised results" across analytical laboratories because ISO17025:2005 is not per se a prescriptive accreditation standard that mandates one and only one method X to be used for a particular type of analysis. By the same token, accreditation to ISO17025:2005 does not by default guarantee a laboratory thus accredited will generate internationally comparable results. I have discussed examples of inconsistent application of ISO17025:2005 guidelines by different national accreditation services in the 2nd edition of my textbook *Stable Isotope Forensics* (Wiley; ISBN 9781119080206).

Furthermore, ISO17025:2005 has been specifically designed for accreditation of analytical laboratories. Its scope does not cover or extend to forensic science areas such as forensic psychology. ISO17025:2005 is therefore not fit for purpose for all aspects of forensic science.

A potential way forward to address this situation may be a two-tier approach whereby forensic analytical laboratories concerned with work on physical evidence should be accredited to ISO17025:2005. However, competence of individuals, i.e. forensic scientists and forensic practitioners should be assessed by subject specific recurrent certification. Certification schemes of this kind are being operated by the American Board of Forensic Anthropology, ABFA (http://theabfa.org/faq/applicants/) or the Forensic Isotope Ratio Mass Spectrometry network, FIRMS (http://forensic-isotopes.org/ffap.html). This way an analytical laboratory acting as forensic science service provider ought to be ISO17025:2005 accredited while its key members of staff involved with evaluation and interpretation ought to be board certified. On the other hand, a forensic scientist active in an area that is not laboratory based would have to seek certification as approved forensic practitioner in their specialist field.

Unfortunately, the closure of the Council for the Registration of Forensic Practitioners (CRFP) on 31 March 2009, mid-way through the Government’s consultation into the future regulation of forensic practitioners, has left a vacuum in regulation and certification of forensic practitioners and ultimately in controlling and assuring quality of provision of forensic science services.

Q9: The Forensic Science Regulator (FSR) should have statutory powers to issue guidelines, setting standards, make recommendation or even accredit or certify courses of professional development for members or stake holders of the Criminal Justice System. The FRS also requires statutory powers to investigate alleged potential failings or misconduct by forensic practitioners. Statutory powers of the FRS should also include powers to enforce compliance with guidelines and standards as well as powers to deal with cases on non-compliance. Powers of enforcement should at the very least include to prohibit further activities by e.g. barring forensic practitioners from future case work if their work was found to be scientifically flawed or if misleading evidence was presented to the courts.

The statutory powers of the FRS should also include administering a certification scheme for forensic practitioners (see Q8).
Q10: Provision of forensic science services in Scotland (SPA Forensic Service) and Northern Ireland (FSNI) offer two excellent examples of how forensic science services should be integrated in the overall framework of the Criminal Justice System. Personally, I am leaning more towards the FSNI as a model for one or more forensic science service providers in England and Wales because the FSNI is an agency within the Department of Justice. Only a forensic science service provider integrated in the Criminal Justice System will reassure the public of its independence and impartiality, especially if its services are available to both prosecution and defence interests in criminal cases. At the same time an integrated forensic science service is best suited to guarantee a "cradle-to-grave" audit trail which is essential in support of the unique crime scene to court partnership between operational policing and the wider criminal justice system.

For forensic science service provision to be an integral part of the Criminal Justice System is essentially the norm overseas. Forensic science service is either a national agency within the Ministry of Justice (Netherlands Forensic Science Institute) or is organised in a way that reflects the governmental structure of a country as is the case in countries with a federal structure of government such as Australia or Germany. In such countries, one service provider supports a police service operating on a national (federal) level (either within the Ministry of Justice or the Ministry of the Interior = Home Office in UK terms) and in support of federal state (county) police forces there is one forensic science service laboratory per federal state (county). These county forensic science laboratories are either an integral part of the county police force (similar to the Scottish model) or are part of either Justice or Interior Ministry of the devolved county government.

Q12: The continued (and to a degree justified) demands for scientifically robust forensic evidence leading to more secure convictions and more transparent or better communicated forensic science are the justification for further and continued research funding of forensic science. Like any other life science or natural science subject, forensic science is not static but constantly evolving. The scope of funding needs to recognise that improvements come either in leaps or incrementally. Neither a one-off time limited research programme nor focusing on one particular aspect will be fit for purpose. Instead the focus should be everything and anything that will help to achieve the aforementioned demands. That being said, one focus should be on pattern recognition applied to physical forensic evidence in conjunction with Bayesian, Neural Networks and/or Topographical data analysis given the wide range of applications.

Considering the interdisciplinary nature of forensic science it may be worthwhile to create something like a National Institute for Forensic Science which would be responsible for:

1. Sponsor, support and fund research in forensic science;
2. Advise and assist with the development and coordination of forensic science services;
3. Gather and exchange forensic information;
4. Support, coordinate and conduct training and certification programmes for forensic science practitioners;
5. Assist the FSR in conducting relevant quality assurance programmes.
Q12 continued: The governing board of such a national institute could comprise the Forensic Science Regulator, a representative of the Crown Prosecution Service, representatives of the police, representatives of forensic science laboratories and representatives of higher education institutions actively engaged in forensic science teaching, research and communication.

Ideally, such a national forensic science institute would have to have budgetary control over a dedicated research and development budget from which to fund forensic science research. However, consideration should also be given to establishing forensic science research as a strategic cross-council research priority for RCUK.

Q13: Current gaps in forensic science and/or understanding of forensic science are almost entirely the results of lack of funding for systematic longitudinal forensic science research, especially research into increasing robustness and reliability of forensic science evidence.

Between 2013 and 2016 out of 10 research proposals received and categorised under the SET name "Forensics", the EPSRC funded only three. By contrast, in the same period the EPSRC received a total of 6,729 research proposals of which 2,318 were funded. In one instance categorising the project as Forensics stretched the envelope somewhat. The particular project aimed to develop an autonomous robotic system able to navigate through unknown environments. The only forensic of its numerous applications was the collection of evidence in dangerous or difficult to access locations. The second funded project addressed cybercrime in the Cloud. Only the third research project dealt with innovative forensic science aiming to develop an electrochemical self-assembling, self-healing and renewable nano-plasmonic system for the ultrasensitive Raman spectroscopy detection of a wide class of toxins, narcotics, and explosives. No details were available on the seven research proposals not funded. It is therefore impossible to say if any of these aimed to address questions concerned with the important issues of robust, accurate and transparent forensic science.

Virtually all interpretation of physical or biological forensic science evidence comes down to pattern comparison or pattern recognition. Inextricably linked to this are questions such as at which level does a probabilistic answer mean two pieces of evidence are related, linked or indistinguishable or if, when and how does measurement uncertainty affect accuracy, probability and reliability of interpretation and conclusions drawn? To be able to answer such questions one requires very large data sets that can be analysed and interrogated by statistical tools in a meaningful way. As a further benefit of funding research that either generates or collates such data sets in combination with their statistical analysis and interpretation such research projects will almost inevitably generate results that will help translating or illustrating and thus better communicating forensic science evidence and its meaning to police, prosecutors, lawyers, judges and, last but not least, members of the public acting as jury (see Figure 1).

Most of the research gaps have been identified already by the demands for more robustness of forensic science methods, more robustness of forensic evidence and better transparency and communication of forensic science. Formal articulation e.g. in form of calls for research proposal could be put in the hands of a National Institute for Forensic Science as proposed in my answer to Question
12. Research questions to be urgently addressed and answered by research proposal could be identified on the basis of "wish lists" submitted by stakeholders and/or end-users.

Figure 1: Similarity plot based on a multivariate data set of four independent variables (sample characteristics). Case samples #1 and #2 are linked at a similarity level of 93% but are not related to case samples #4 and #5 which are linked at a level of 95%. Control samples #9 and #10 are linked at a level of 91%. Positive control samples #9 and #10 are known to be identical since they were taken as subsamples from the same parent material.

Q14: The short answer to this question is this: a culture of continuing innovation and research can only be developed and sustained by continued financial investment in forensic science teaching, research and development.

A clear distinction should be made between Forensic Science Service providers and institutions engaged in forensic science research and development. Forensic Science Service provision and research are not mutually exclusive but are difficult to undertake under the same roof in parallel to criminal case work given the work load arising from providing services to the Criminal Justice System. Fundamental and applied forensic science research should be carried by higher education institutions (HEI) habitually engaged in teaching of and research in forensic sciences. However, forensic science research projects undertaken by HEIs should ideally always be carried out in close collaboration with end-users, especially forensic science service providers to ensure end-user needs are being
met. However, role and level of end-user involvement should not be prescribed since this will vary from case to case.

Q14 continued: The importance of closely involving HEIs cannot be overstated and should not be underestimated. HEIs’ role in all this is of particular importance. The best or most likely way to ensure forensic evidence used in the criminal justice system is robust and meets stake-holders as well as the public’s expectations on quality, reliability and impartiality is a bottom-up approach by instilling the underlying ethos and professionalism in students of forensic science degree courses. What better way for future generations of forensic scientists to learn and appreciate the importance of robust scientific methodology while at university (a) by being taught by research active academics and (b) by involving students hands-on with projects that are part of their BSc Hons and/or MSc by Research degrees?

Q15: Responsibility for continued professional development should rest with individual forensic practitioners and forensic science service providers. Oversight ensuring this responsibility is being met should rest with the office of the FSR.

13 September 2018