The International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG), would like to provide information to address the above inquiry. IUGS-IFG launched at the 62nd Executive Committee meeting of the IUGS, at UNESCO headquarters, in Paris, France, on 22 February 2011. The aim is to develop forensic geology internationally and promote its applications. The objectives of the IUGS-IFG are as follows:

1. Collate and disseminate data and information on forensic geology applied to policing and law enforcement, criminal, environmental and civil investigations;
2. Promote international meetings, seminars, conferences and training;
3. Develop a ‘Committee’ to act as principal advisers, collaborators and active participants;
4. Develop an international network whereby each ‘member’ will act as a principal contact in their respective country for the collation and dissemination of information on forensic geology;
5. Collate, make available and where appropriate review any existing documentation and publications in forensic geology; and
6. Produce a document endorsed by the Committee called; ‘A Guide to Forensic Geology’.

Forensic geology (also known as Forensic Geoscience or Geoforesnics) is; ‘the application of geology to policing and law enforcement, which may potentially be applicable to a court of law’. Forensic geology assist police and law enforcement in relation to serious crimes (homicide, rape, and sexual assaults), organized crime, counter terrorism, kidnapping, humanitarian incidents, environmental crimes, wildlife crime, precious minerals and metals theft, minerals substitution and sample adulteration, illegal mining, fraudulent crimes, fakes, geohazards, geotechnical engineering, engineering geology, ground and water searches for buried graves and other concealed items related to homicide, serious organised crime and counter terrorism. In the United Kingdom, forensic geology played a significant part in the Soham Murders and numerous searches for graves; in Ireland, in the Earl Mountbatten murder; in Italy, the abduction and assassination of Prime Minister Aldo Moro; in the United States, the Green River serial killer investigation. IUGS-IFG would like to address this inquiry and draw the committee’s attention to the following key points:

1. The lack of funding in the UK for forensic geology research;
2. The benefits of involving geologists in police/forensic investigations including: (i) searches for graves, missing persons, burials and concealed items, (ii) crime scene investigations and (iii) the provision of geological trace evidence;
3. The need for regulation and accreditation in forensic geology (and forensic science);
4. Improved dissemination of information on strategies, methods and techniques; and
5. Training in forensic geology and the production of guidance and standard operating procedures

1. Is forensic science contributing to the delivery of justice in the UK?
The criminal justice system relies heavily upon the multi-disciplinary evidence provided by forensic science. Evidence provided by forensic science is (should be) objective and the test work repeatable. It is difficult to envisage how a criminal justice system may function without services from evidence-based forensic science. Forensic geology is hindered by a lack of evidence-based research and the absence of approved standards.

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

The strengths of forensic (geology) science is that the results are objective, measurable, impartial and repeatable. The analysis and interpretation should be conducted by forensic scientists that are suitably qualified, appropriately experienced and vetted. A weakness of forensic geology is that it is not regulated to ensure the above. Furthermore, there is an absence of guidance, standard operating procedures and protocols to ensure a consistent and approved approach. The closure of the Forensic Science Services in 2010 resulted in the establishment and growth of forensic science services provided from the private sector and consultancy. This has generated the perception that forensic science is focussed on income generation and profit making, which could compromise the quality of services. Although, the evidence in support of this is unclear.

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 evidence base depends on: (a) the relevance of the correct legal questions being asked, (b) the quality and integrity of subsequent forensic science investigation conducted and (c) how the evidence is effectively communicated and reported. From a forensic geology perspective, there are significant gaps in the evidence-base. For instance, the ground (i.e. soils, sediments, rocks, microfossils and water) or materials derived from geological products (e.g. glass, bricks, tiles) are complex and variable. As such, these can be used to provide physical evidence (e.g. to identify the provenance of an item or object or to place a geographical offender at a location) or the ground can be searched to locate a burial. These gaps forensic geology knowledge require research and investigation. Including the establishment of national, evidence-based databases, and approved search methodologies.

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?

The Criminal Justice System may benefit by:
• The independent and impartial monitoring and regulation of forensic science practice in the UK;
• Guiding forensic investigations and scrutinising results and practitioners;
• The establishment of an advisory panel and approved list of forensic practitioners;
• The National Crime Agency (NCA) operates the Expert Advisers (EA) database, which some forensic geologists have been invited to join. Those on the ‘EA List’ are vetted, scrutinised and have a proven track record. This offers a degree of assurance to those who request the services of a forensic geologist that are registered on the database. However, not all reputable forensic practitioners are included;
• A clearer and fair and transparent commercial system for the appointment of a forensic scientist;
• Formal knowledge exchange, capacity building and training;
• Changes to the appointment of forensic specialist that are base on personal relationships;
• The provision of clear terms and conditions for forensic science investigations, including; (i) objectives, (ii) scope, (ii) time frames, (iii) deliverable and date, (iv) fees and expenses, (v) terms and conditions.
• Funding to pay for forensic services and less reliance on volunteer contribution; and
• Forensic reports should be subject to checking and peer review to assist with improving the communication of forensic information and results between the forensic scientists, police, lawyers and the judiciary.

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?

The levels of understanding of forensic geology applications, methods and techniques are variable. These are generally low within the Criminal Justice System amongst lawyers, judges, juries, and police. There is the need for the design and delivery of knowledge exchange, capacity building and training courses. IUGS-IFG has been proactive in delivery of these throughout the world to police, law enforcement, judges, barristers, other legal professionals and forensic scientists, and in producing publications and guidance. These can be adapted for delivery in the UK. However, the lack of resources and funding has hindered this advancement.

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

Training in forensic geology for practitioners, lawyers and the judiciary does not formally exist. Although, by invitation, members of IUGS-IFG have engaged with the Home Office (CAST), National Crime Agency, Police National Search Centre and others to provide ad-hoc training in forensic geology.

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?

There is no way of determining with a high level of confidence if forensic science services in the UK are sustainable. However, for forensic geology to become sustainable this requires as a minimum, the following:

- Investments in forensic geology teaching and research;
- Formal training, learning and development;
- The professionalisation of the forensic science profession;
- Regulation and accreditation of forensic geology;
- Forensic geologists are not employed by the police or private forensic consultancies. As such, other forensic specialist conduct work that should be undertaken by forensic geologists;
- There is enormous interest in forensic science from schoolchildren and university students. However, there seems to be relatively little support to encourage these students to enter the forensic (geology) science profession. There is a perception that there are no or few opportunities, and these are not too well paid. This could negatively influence the sustainability of forensic science.

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

The system of accreditation in forensic geology is not sufficient. For years, forensic geologists have been discussing ways to standardise, regulate and accredit forensic geologists. One of the most significant challenges has been which organisation should or could perform the accreditation? In the early 2000s, there was collaboration with the Council for the Representation of Forensic Practitioners (CRFP), but this was found not to be appropriate for the registration of forensic geologists. The Geological Society of London offers its members Chartered Geologists (CGeol), Chartered Scientist status (CSci) and European Geologist (EuroGeol) status and CPD registration. However, the Geological Society is not a ‘forensic’ organisation to regulate ‘forensic’ geology practitioners. The debate continues amongst forensic geologists.

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

A Forensic Science Regulator could have a role to ensure and enforce the UK can offer a robust, accurate, transparent and impartial forensic science service. The regulator could assess and evaluate forensic practices (in both the government, private sector and research) to ensure forensic science is conducted and delivered in accordance within approved professional manner and within a recognised code of conduct. The Forensic Science Regulator should be empowered to withdraw a ‘licence’ to practice forensic science where conditions or standards become breached. The Regulator would also need advice on the role of the forensic geologist from an impartial person or group of persons.
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?

The laboratory in Northern Ireland is located in a police facility, potentially giving the perception of not being impartial. However, some police forces in England and Wales have established forensic laboratories, thus starting to accidentally make the different systems similar. The main issue with this, is who carries out work for the Defence, and where? There is a balance between the need for impartiality and the commercial and financial resources required to establish and sustain forensic laboratories. Auditing these facilities could perhaps be one of the responsibilities of the Forensic Science Regulator (see above). Forensic (geology) science expertise is nationally distributed in academia, consultancy, contractors and individuals. In other words, there is no single organisation in the UK can provide the complete range and scope of forensic science services required. IUGS-IFG has collaborated with numerous, international, federal police forces, law enforcement and forensic organisation in for example; Australia, Argentina, Brazil, Canada, Chile, China, Colombia, Italy/Sicily Japan, Russia, South Africa, Spain, United Arab Emirates and USA. Many organisation have in-house forensic geology teams to provide the services. For instance, the Brazilian Federal police employ teams of geologists, the Abu Dhabi Police have established a Forensic Geology Group, the Australian Federal Police have a search team with geophysics capability, the FBI have a lab that employs forensic geologists, etc. It is recognised that such a team could not exist within the current UK policing structure. However, the UK could benefit from the establishment of a formal forensic science/geology advisory panel comprising experts from a range of background, to provide timely, appropriate and proportionate advice and guidance (this, and their time and expertise provided would need to be formally commissioned and paid for). A solution, adopted in some parts of the world, has been the outsourcing geological and soil examination to specialist geological, soil or mineralogical laboratories. In Australia the Centre for Australian Forensic Soil Science (CAFSS) within the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has been providing such a service for over fifteen years. During this time demand for services has increased significantly showing that where the value of earth material examinations becomes appreciated by investigators and lawyers its application in casework widens. For example, in Australia several State Police Forces and forensic laboratories have CAFSS listed on their formal forensic science/geology advisory panels.


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?

This can only be determined followed detailed debate and discussion, as each forensic science practitioner and researcher may have a biased view on where research funding should be justified. There is the need for baseline research on search, burials detection, crime scene investigation, collection and sampling of
geological evidence, and the translation of forensic geology to other disciplines (e.g. archaeology, mining and engineering).

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?

In the past decade and more, the establishment of the multi-institutional ‘Soil Fit’ and ‘GIMI’ projects generated significant results. These advanced forensic soil science expertise, for example by the James Hutton Institute (formerly the Macaulay Institute) and CAFSS, and the establishment of forensic soils laboratories and capabilities that now supports Police Scotland. The 3-dimensional variability and complexity of the ground, (including soils, sediments, rocks and water) requires the establishment of databases to aid and assist forensic geology investigations, including searches for burials and the provisions of geological trace evidence (databases). In the past 20 years, forensic geologists, working in collaboration with law enforcement, have developed new and innovative strategies to search the ground for burials. There is now the need for these methods to become disseminated and standardised. Forensic science seems to have become fragmented with little or few incentives for the multi-disciplinary elements of forensic science to collaborate. Take for example forensic geology and forensic archaeology, there are similarities, yet the collaboration is generally poor, reliant on a few individuals. Forensic geology is lacking on the agenda of research councils and could be aimed at for example; NERC, EPSRC, British Geological Survey and key universities. IUGS established and funded the Initiative on Forensic Geology that has assisted with the global development and advancement of forensic geology (see for example ‘Episodes’, Vol 40, No.2 June 2017).

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

Some innovation in forensic geology is being undertaken in the UK; however, this is generally ad-hoc relying on the good will, dedication and voluntarily commitment of a minority. Take for example, the new and innovative search methods that have developed that are routinely practised nationally and globally. There is however, a lack of funding and the absence of a single centre of excellence in forensic geology/science in the UK to enable a culture of innovate. The employment of forensic geologists within the police, collaborating within the private sector and academia, may assist in developing a culture of forensic (geology) science.

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

As experienced forensic geologists retire, there is some evidence not only in the UK but across the world (e.g. Australia, Japan, Italy and USA) that the next and younger generation are not entering the profession (as noted above). The responsibility to ensure there is a next generation of forensic geologists to design and delivery training could rest with professional bodies (e.g. IUGS Initiative on Forensic Geology, Geological Society of London Forensic Geoscience Group) in conjunction with Police Forces, the Police National Search Centre and
the National Crime Agency. BSc, MSc, PhD and post-doctoral positions could be offered by more universities. What is more, geologists and soil scientists require training in some aspects of policing and the judicial system, this could be introduced at BSc level. Ideally, the national school curriculum could include an introduction to forensic science, including forensic geology, to maintain and develop the enthusiasm and huge interest amongst schoolchildren and university students.

16. Are there gaps in the current evidence base for digital evidence detection, recovery, integrity, storage and interpretation? No comments.

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? No comments.

Submitted by: Dr Laurance Donnelly, Chair, IUGS Initiative on Forensic Geology

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