CONFIDENTIAL

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)

INITIATIVE ON FORENSIC GEOLOGY (IFG)

ANNUAL REPORT FOR 2016

DR LAURANCE DONNELLY, CHAIR IUGS-IFG
INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)
INITIATIVE ON FORENSIC GEOLOGY (IFG)

Annual Report 2016

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1  
**TITLE OF CONSTITUENT BODY**

The International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG) was launched at the 62nd Executive Committee meeting of the IUGS, at UNESCO headquarters, in Paris, France, on 22nd February 2011.

1.1  
**Report Objective**

This document is the IUGS-IFG Chair’s annual report for 2016. It has been produced for the IUGS Executive Committee and it gives summary of the IFG activities throughout 2016. A financial summary of the IFG accounts is also included.

2  
**AIM**

2.1  
**Mission Statement**

The aim of IUGS-IFG is to develop forensic geology internationally and promote its applications.

2.2  
**IUGS-IFG Objectives**

The objectives of the IUGS-IFG are to:

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 to be called; ‘A Guide to Forensic Geology’.

3  
**ROLE WITHIN IUGS SCIENCE POLICY**

3.1  
**Background**

The documented history of forensic geology can be traced to the latter half of the 19th Century. However, in recent years there has been renewed interests and developments in the multidisciplinary fields of forensic geology throughout the world. Since about 2000 numerous international meetings, conferences, seminars and training on different aspects of forensic geology has taken place. Furthermore, several text books have been published and there are technical papers in peer reviewed scientific journals, conference proceedings, magazines, police and law enforcement magazines. Since 2011 IFG has formally represented the IUGS global interests in forensic geology. As such, IUGS-IFG provides training, capacity building, knowledge transfer and outreach events. These advocate the IUGS-IFG aim, ‘to develop forensic geology internationally and promote its applications’. The members of the IFG committee are senior representatives of their respected organisations and include geologists, geoscientists, police officers, forensic scientists and law enforcement agencies.

3.2  
**Main Approach**

IUGS-IFG aims to raise the global awareness of forensic geology by holding meetings and conferences, promoting research, teaching, training and the operational deployment of forensic geologists. This will be consistent with the broad objectives of IUGS, and includes the following:

- **Knowledge transfer and capacity building:** This raises the levels of awareness and knowledge, and provides information about forensic geology;
- **Technology transfer**: This improvement in skill sets; and
- **Outreach**: This provides education and information to a range of stakeholders that include; geologists, geoscientists, serving police officers, law enforcement organisations, the public, schools and universities, engineers, lawyers and the legal profession, forensic scientists, the media and politicians.

## 4 Organization

The IUGS-IFG Committee comprises representatives from major geographical regions of the world and comprises specialists from academia, industry, consultancy, operationally based forensic geologists, the police, law enforcement agencies and forensic organisations, as shown in Figure 4.1 and Table 4.1.

![Figure 4.1 Structure of the IUGS-IFG Committee in 2016-2017](Image)

### 4.1 IFG Committee Changes

In 2016, Dr Guo Hongling, Institute of Forensic Science, Ministry of Public Security, Division of Trace Evidence Analysis, in China, was assigned to the IUGS-IFG Committee as the Officer for China.

Dr Ritsuko Sugita, who was the Officer for Asia will now focus on developing and promoting forensic geology in Japan.

In 2017, the IUGS-IFG committee propose to further expand and, for example, to appoint an Officer to manage the Geoforensic International Network (GIN) and appoint an Officer for Asia.
<table>
<thead>
<tr>
<th>POSITION</th>
<th>NAME</th>
<th>COUNTRY</th>
<th>AFFILIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair</td>
<td>Dr Laurance Donnelly</td>
<td>England (UK)</td>
<td>IUGS-IFG &amp; Arup, Manchester, England, UK</td>
</tr>
<tr>
<td>Vice Chair</td>
<td>Prof Rob Fitzpatrick</td>
<td>Australia</td>
<td>CSIRO, Australia</td>
</tr>
<tr>
<td>Treasurer</td>
<td>Prof Lorna Dawson</td>
<td>Scotland (UK)</td>
<td>The James Hutton Institute, Aberdeen, Scotland, UK</td>
</tr>
<tr>
<td>Secretary</td>
<td>Ms Marianne Stam</td>
<td>USA</td>
<td>California Department of Justice, Los Angeles, USA</td>
</tr>
<tr>
<td>Webmaster/Information Officer</td>
<td>Dr Elisa Bergslien</td>
<td>USA</td>
<td>SUNY Buffalo State, New York, USA</td>
</tr>
<tr>
<td>Geoforensic Law Enforcement Adviser</td>
<td>Commander Mark Harrison, MBE</td>
<td>Australia</td>
<td>Australia Federal Police, Australia</td>
</tr>
<tr>
<td>FBI Adviser</td>
<td>Dr Jodi Webb</td>
<td>USA</td>
<td>Federal Bureau of Investigation (FBI), Virginia, USA</td>
</tr>
<tr>
<td>Training and Publications</td>
<td>Dr Alastair Ruffell</td>
<td>Ireland (UK)</td>
<td>Queens University Belfast, Northern Ireland</td>
</tr>
<tr>
<td>Communications</td>
<td>Dr Jennifer McKinley</td>
<td>Ireland (UK)</td>
<td>Queens University, Belfast, Northern Ireland</td>
</tr>
<tr>
<td>Special Publications Adviser</td>
<td>Dr Duncan Pirrie</td>
<td>England (UK)</td>
<td>Helford Geoscience LLP, Cornwall, UK</td>
</tr>
<tr>
<td>Forensic Science Adviser</td>
<td>Prof Ruth Morgan</td>
<td>England (UK)</td>
<td>University College London, JDI Centre for the Forensic Sciences, London, UK</td>
</tr>
<tr>
<td>Geological (Trace) Evidence Advisers</td>
<td>Dr Skip Palenik, Dr Chris Palenik</td>
<td>USA</td>
<td>Microtrace LLC, Illinois, USA</td>
</tr>
<tr>
<td>Honorary Committee Member</td>
<td>Dr Raymond Murray</td>
<td>USA</td>
<td>Forensic Geologist, Montana, USA</td>
</tr>
<tr>
<td>Officer, USA</td>
<td>Dr Bill Schneck</td>
<td>USA</td>
<td>Washington State Patrol Crime Lab</td>
</tr>
<tr>
<td>Officer, Latin America</td>
<td>Dr Carlos Molina Gallego</td>
<td>Colombia</td>
<td>Instituto Nacional de Medicina Legal y Ciencias Forense, Bogota, Colombia</td>
</tr>
<tr>
<td>Officer, Europe</td>
<td>Dr Rosa Maria Di Maggio</td>
<td>Italy</td>
<td>Geoscienze Forensi Italia (Formerly Servizio Polizia Scientifica), Rome, Italy</td>
</tr>
<tr>
<td>Officer, Russia &amp; CIS</td>
<td>Dr Olga Gradsusva, Dr Ekaterina Nesterina</td>
<td>Russia</td>
<td>Russian Federal Centre of Forensic Science and Soil Trace Evidence Experts, Moscow, Russia</td>
</tr>
<tr>
<td>Officer, Middle East</td>
<td>Captain Ahmed Saeed Al Kaabi, Captain Khudooma Said Al Naimi, Lieutenant Saleh Ali Al Katheeri</td>
<td>UAE</td>
<td>Abu Dhabi Police, Forensic Evidence, United Arab Emirates</td>
</tr>
<tr>
<td>Officer, Japan and Asia</td>
<td>Ritsuko Sugita</td>
<td>Japan</td>
<td>National Research Institute of Police Science, Japan</td>
</tr>
<tr>
<td>Officer, Australia</td>
<td>Prof James Robertson</td>
<td>Australia</td>
<td>University of Canberra, Australia</td>
</tr>
<tr>
<td>Officer, Pacific</td>
<td>Prof Shari Forbes</td>
<td>Australia</td>
<td>University of Technology, Sydney, Australia</td>
</tr>
<tr>
<td>Officer, Canada</td>
<td>Prof Grant Wach</td>
<td>Canada</td>
<td>Dalhousie University, Nova Scotia, Canada</td>
</tr>
<tr>
<td>Officer, Africa</td>
<td>Dr Roger Dixon</td>
<td>South Africa</td>
<td>University of Pretoria (Formerly, Forensic Science Laboratory, South African Police Service, South Africa</td>
</tr>
<tr>
<td>Officer, China</td>
<td>Dr Guo Hongling</td>
<td>China</td>
<td>Institute of Forensic Science, Ministry of Public Security, Division of Trace Evidence Analysis, China</td>
</tr>
</tbody>
</table>

Table 4.1 IUGS-IFG committee in 2016
5 Extent of National, Regional & Global Support from Sources Other Than IUGS

During 2016 support for IUGS-IFG was provided by individual committee members and their respective employers/organisations. The in-kind value of this support is considerable. IUGS-IFG has estimated that the Committee Officers have provided at least 186 person days during 2016. This has incurred by attendance at conferences, training courses, knowledge transfer events, provision of outreach events and the management of the Initiative. The value of this in-kind support is difficult to quantify, however a commercial value to the time spent on the IUGS-IFG in 2016 would possibly be in excess of approximately USD $154,000. In addition, participation in the various IUGS-IFG events during the year has also been supported directly by committee members employers and via research funding of an estimated value of approximately USD ($) 36,000.

6 Acknowledgements

Throughout 2015, IUGS-IFG received support from numerous organisations, which include the following:

- **IUGS Executive Committee.**
- **Prof Peter Bobrowsky, Dr Brian Marker MBE, Prof Calvo, Prof Komac, Mr Edmund Nickless.**
- **Commercial companies:** Helford Geoscience LLP (UK), Microtrace LLC (USA), James Hutton Limited and Geoszience Forensi Italia (Italy), Mala (Mike Langton).
- **Police Forces, Law Enforcement and Federal Agencies:** California Department of Justice, Federal Bureau of Investigation (USA), Australian Federal Police (Australia), Washington State Patrol Crime Lab (USA), Abu Dhabi Police (UAE), Russian Federal Centre of Forensic Science (RFCFS) of the Ministry of Justice of Russia (Russia), National Research Institute of Police Science of Japan (Japan), Servizio Polizia Scientifica (Italy), Carabinieri (Italy), Brazilian Federal Police (Brazil), National Crime Agency (NCA) (UK), Police National Search Centre, The College of Policing (UK), Home Office Centre for Applied and Scientific Research (CAST) (UK), Greater Manchester Police (GMP) (UK), West Yorkshire Police (UK), South Yorkshire Police (UK), Police Scotland, Inspector Graham Peffers (GMP and NCA), Inspector Colin Hope (NCA) Mike Ferguson (CAST), Inspector Jon Feather (UK), Geoff Knuffer MBE, An Garda Síochána Headquarters, Independent Commission for the Location of Victims’ Remains.
- **Universities, Research Institutes and Professional Societies:** University of Messina (Sicily), The American University of Rome (Italy), Institute of Forensic Science in China, University of Pretoria (South Africa), Dalhousie University (Canada), National Research Institute of Police Science (Japan), CSIRO (Australia), Centre for Australian Forensic Soil Science (CAFSS) (Australia), Buffalo State College (USA), Queens University Belfast (Northern Ireland), the James Hutton Institute (Scotland, UK), University of Canberra (Australia), University of Technology, Sydney (Australia), University of Keele Department of Earth Sciences (UK), University College London (UK), University of Staffordshire, (UK), University of Pretoria (South Africa), Nacional Institute of Criminalistics (INC) (Brazil), Instituto Nacional de Medicina Legal y Ciencias Forense (Colombia), The Geological Society of London (Forensic Geosciences Group, Near Surface Geophysics Group, Western Regional Group, North West Regional Group), University College London, JDI Centre for the Forensic Sciences, Australian Facility for Taphonomic Experimental Research (AFTER), Yorkshire Regional Group of the Geological Society of London, East Midlands Regional Group of the Geological Society of London, Institute of Geologists of Ireland, Geological Survey of Ireland, Japanese Society of Geo-pollution Science, Medical Geology and Urban Geology, University of Leicester, Department of Geology, Organising Committee of the 35th International Geological Congress, University of Bristol, Chartered Institute for Archaeologists, John Moores University, Home Office (CAST).
### 7 INTERACTION WITH OTHER INTERNATIONAL PROJECTS & ORGANISATIONS

Throughout 2016, IUGS-IFG interacted and collaborated with the organisations and projects that included those listed in Table 7.1:

<table>
<thead>
<tr>
<th>Event</th>
<th>Type of Interaction</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>69th IUGS Executive Committee Meeting, Kunming, China</td>
<td>Committee meeting</td>
<td>NA</td>
</tr>
<tr>
<td>Australian Facility for Taphonomic Experimental Research (AFTER)</td>
<td>Research</td>
<td>Human decomposition and searches for burials</td>
</tr>
<tr>
<td>Search for a Buried Target, UK</td>
<td>Operation support</td>
<td>Confidential</td>
</tr>
<tr>
<td>Yorkshire Regional Group of the Geological Society of London, Leeds, UK</td>
<td>Outreach</td>
<td>Invited speaker</td>
</tr>
<tr>
<td>Planning, 4th International Conference on Engineering Geophysics, UAE</td>
<td>Knowledge exchange and capacity building</td>
<td>Conference in 2017</td>
</tr>
<tr>
<td>Home Office (CAST) &amp; UCL, UK</td>
<td>Outreach</td>
<td>Invited speaker</td>
</tr>
<tr>
<td>Search for a Mine Shaft</td>
<td>Operation support</td>
<td>Confidential</td>
</tr>
<tr>
<td>Seminario, Geologia Forense, Università degli Studi di Catania, Sicilia, Italia</td>
<td>Training</td>
<td>MSc</td>
</tr>
<tr>
<td>Forensic Geologist Opportunity with the Abu Dhabi Police</td>
<td>Employment position</td>
<td>NA</td>
</tr>
<tr>
<td>Experimental Forensic Geology, Colombia, South America</td>
<td>Research</td>
<td>PhD</td>
</tr>
<tr>
<td>IUGS Ad Hoc Review of IFG, Manchester, UK</td>
<td>IUGS Review</td>
<td>NA</td>
</tr>
<tr>
<td>Police Search for Missing Person, Midlands, UK</td>
<td>Operation support</td>
<td>Confidential</td>
</tr>
<tr>
<td>Seminario, Geologia Forense, Università degli Studi di Palermo, Sicilia, Italia</td>
<td>Knowledge exchange and capacity building</td>
<td>MSc</td>
</tr>
<tr>
<td>Seminario, Geologia Forense, Università degli Studi di Calabria, Sicilia, Italia</td>
<td>Knowledge exchange and capacity building</td>
<td>MSc</td>
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<tr>
<td>European Geosciences Union General Assembly, Vienna, Austria</td>
<td>Outreach</td>
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<tr>
<td>Environmental Crimes, Belfast, Northern Ireland and Australia</td>
<td>Knowledge exchange and capacity building</td>
<td>International report</td>
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<tr>
<td>Forensic Geology in Morocco</td>
<td>Planning meeting</td>
<td>Teaching</td>
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<td>Taphonomic Chemistry and Grave Detection, University of Staffordshire, UK</td>
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<td>Teaching</td>
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<tr>
<td>Month</td>
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<td>Type</td>
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<tr>
<td>June</td>
<td>Geological Society of London, (EMRG) &amp; BGS, Nottingham, UK</td>
<td>Outreach</td>
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<tr>
<td></td>
<td>An Garda Síochána Headquarters, ICLVR, Dublin, Ireland</td>
<td>Knowledge exchange and capacity building</td>
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<td>IGI and GSI, Dublin, Ireland</td>
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<td>Forensic Geology and BAHD, Dundee, Scotland</td>
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<td>Forensic Canines Detector Dogs</td>
<td>Planning meeting</td>
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<td>Search for Holocaust War Graves in Lithuania, Europe</td>
<td>Outreach</td>
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<td>Japanese Society of Geo-pollution Science, Medical Geology and Urban Geology</td>
<td>Knowledge exchange and capacity building</td>
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<td>July</td>
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<td>11th GeoENV, Lisbon, Portugal</td>
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<td></td>
<td>EuroSoil 2016, Turkey</td>
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<tr>
<td>August</td>
<td>5th European Meeting on Forensic Archaeology (EMFA), Dublin Castle, Ireland</td>
<td>Outreach</td>
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<td>Medicolegal Death Investigation Conference, Montana, USA</td>
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<td>Forensic Soil Science and Geology, 35th IGC, Cape Town, South Africa</td>
<td>Knowledge exchange and capacity building</td>
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<td>Hillsborough Castle Skeleton, Northern Ireland</td>
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<td>September</td>
<td>The Disappeared, Pinochet’s Dictatorship, Chile</td>
<td>Knowledge exchange and capacity building</td>
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<td>Art Forgeries</td>
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<td>Geological Fakes and Fraud, SWRG, University of Bristol,</td>
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<td>ANZFSS, Auckland, New Zealand</td>
<td>Knowledge exchange and capacity building</td>
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<td>October</td>
<td>Forensic Geology and Chartered Institute for Archaeologists (CIfA)</td>
<td>Knowledge exchange and capacity building</td>
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<td>Forensic Geology and Earth Science Week, GSL, Cheshire, UK</td>
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<td>Institute of Forensic Science Ministry of Public Security, China</td>
<td>Knowledge exchange and capacity building</td>
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<td>December</td>
<td>National Crime Agency, National Search Adviser, UK</td>
<td>Operational support</td>
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<td>Planning, 3rd Iberoamerican Seminar on Forensic Geology, Argentina</td>
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<td>Brazilian Federal Police, Curitiba, Brazil</td>
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<td>TV Interview on Forensic Geology, Rome, Italy</td>
<td>Outreach</td>
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<td>Rock Analysis, Police</td>
<td>Operational support</td>
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<td>International Union of Geological Sciences, Episodes</td>
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<td>Geological Society of London, Geoscientist</td>
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<td>Forensic Geology and The Media</td>
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<td>Forensic Geology and Crime Writers</td>
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Table 7.1 Selected examples of IUGS-IFG collaboration in 2016
8 CHIEF ACCOMPLISHMENTS

8.1 JANUARY

8.1.1 69th IUGS Executive Committee Meeting, Kunming, China

From 18th to 22nd January 2016, Prof Jose Calvo, IUGS Secretary General, attended the 69th IUGS Executive Committee meeting in Kunming, China, and delivered a presentation prepared by the IUGS-IFG Chair. This gave a summary of IFG’s achievements and included an overview of the global developments and advances in forensic geology. IUGS-IFG received positive feedback on its achievements to-date and was encouraged to continue expanding.

8.1.2 Establishment of the Australian Facility for Taphonomic Experimental Research

The University of Technology, in Sydney (UTS) opened the, ‘Australian Facility for Taphonomic Experimental Research (AFTER).’ IUGS-IFG Officer for Pacific region helped develop and now manages part of this facility. Other IUGS-IFG members have provided advice on geology, geophysics and geochemistry. It is proposed the results of leachate plume experiments conducted in the UK could be repeated at AFTER. It is expected the results will inform open area search strategies to locate unmarked homicide graves, missing person’s remains and victims of genocide or mass disasters.

8.2 FEBRUARY

8.2.1 Yorkshire Regional Group of the Geological Society of London, Leeds, UK

A presentation entitled, ‘Forensic Geology: The Application of Geology to Police and Law Enforcement Investigations’, was provided to the Yorkshire Regional Group of the Geological Society of London, at The Adelphi Hotel, in Leeds, UK.

8.2.2 Meeting with the Home Office (CAST) & UCL, UK

On 24th February 2016, a presentation on forensic geology was given at University College London (UCL) by The Centre for Applied Science and Technology (CAST), which is a core part of the Home Office. This was supported and endorsed by IUGS-IFG. It provided details of land and water searches for burials and concealed targets related to homicide and counter terrorism.

8.3 MARCH

8.3.1 Seminario, Geologia Forense, Università degli Studi di Catania, Sicilia, Italia

As a continuation of the supported provided by IUGS-IFG in 2015, for the Università degli Studi di Messina, IUGS-IFG endorsed a seminar held at the University of Catania, in Sicily, on 18th March 2016. One of the IUGS-IFG committee members has been awarded the position of ‘Visiting Professor’ to help develop forensic geology in Messina, in Sicily.

8.3.2 Meeting on Experimental Forensic Geology, Colombia, South America

An experimental study of forensic geophysics was carried out in two regions of Colombian to evaluate the use of geophysical methods in the search for missing person’s graves. Simulated conditions were consistent with graves found by the judicial police. This included the burial in a rural location of skeletons and other objects in eight graves that measured by 2m by 2m. A further four graves measured 1.7m x 0.7m in a semi-rural location. This included; three pigs that were half covered by clothes. Three human skeletons were also buried. One of these had burned bones, one represented a beheaded skeleton and the third skeletons was complete. The burial depths were 0.5m, 0.8m and 1.2m, respectively. Soil and vegetation samples were collected and rainfall and temperature was monitored. Geophysical data were collected for 25 months in an area measuring 17m x 7m in the rural area and 12 months in an area measuring 11m x 2m in the semi-rural location. Ground penetrating radar, magnetic susceptibility, conductivity and electrical resistivity gave acceptable results in the rural test site and good results in the semi-rural test site.
8.4 APRIL

8.4.1 Review of IFG by IUGS, Manchester, UK\textsuperscript{1,11}

The IUGS Ad Hoc Review Committee (ARC) was convened to review the progress of IFG. This mandatory review was held on 4\textsuperscript{th} April 2016, in Manchester, UK, under the Chairmanship of Prof Jose Calvo, Secretary General of IUGS. The other attendee at the meeting was Prof Marko Komac, Vice-President of IUGS. Both interviewed Dr Laurance Donnelly, Chair of the IUGS Initiative on Forensic Geology. Also invited to be present was Dr Alastair Ruffell the IUGS-IG Training Officer. IUGS also invited Inspector Colin Hope, the UK National Search Advisor, from the National Crime Agency. The meeting last about five hours. ARC concluded that during the period 2011-2016 IFG has met and exceeded its objectives. IUGS, via IFG, has provided the opportunity for the development and advancement of forensic geology throughout the world. This has resulted in this multidisciplinary science being firmly established in the geology profession, policing and law enforcement. Looking forward, IUGS suggested several further goals and recommended their continued support for IFG (see Calvo, 2016).

8.4.2 Seminario, Geologia Forense, Sicilia, Italia\textsuperscript{1,3,8,9,18}

On 5\textsuperscript{th} April 2016, IUGS-IFG endorsed and supported a seminar on forensic geology in Palermo, Sicily, organised by the Università degli Studi di Messina.

On 7\textsuperscript{th} April 2016, IUGS-IFG endorsed and supported a seminar on forensic geology at Università degli Studi di Calabria, Sicily, organised by the Università degli Studi di Messina.

8.4.3 Conference Contributions, European Geosciences Union General Assembly, Vienna, Austria\textsuperscript{3}

IUGS-IFG was represented at the EGU General Assembly, from 17\textsuperscript{th}-22\textsuperscript{nd} April 2016. There was 4,863 presentations, 10,320 posters, 619 scientific sessions, 321 associated events and 13,650 scientists from 109 countries. About 25% were students and 53% early career scientists, under the age of 35 years. This provided the opportunity to draw attention to IUGS and forensic geology to wider and younger audiences.

8.5 MAY

8.5.1 Environmental Crimes, Belfast, Northern Ireland and Australia\textsuperscript{2,11}

Environmental crime has been reported by UNEP-INTERPOL to be a growing concern. An IUGS-IFG Officer spoke at Stormont, in Northern Ireland, about this to help inform Government on Policy. The illegal burial of waste has been a particular problem in Italy, Canadian and Ireland.

8.5.2 Seminario, Geologia Forense, Agrigento, Sicilia, Italia\textsuperscript{1,3,8,9,18}

On 12\textsuperscript{th} May 2016, IUGS-IFG endorsed and supported a seminar on forensic geology, held at Castello Chiaramontano di Favara, in Agrigento, Sicily, organised by the Università degli Studi di Messina.

8.5.3 Taphonomic Chemistry and Grave Detection, University of Staffordshire, UK\textsuperscript{1,3,8,9,18}

IUGS-IFG agreed to co-fund a knowledge transfer and skills development event at Staffordshire University. The focus was taphonomic chemistry as part of a multi-disciplinary group for the detection of clandestine land and water-based gravesites. The aim was to utilise a cross-disciplinary approach to identify the non-volatile chemical, biological and physico-chemical markers simultaneously through a universal model (ensuring similar decomposition-parameters between the disciplinary studies). In addition, migration patterns and the extent of migration of the identified markers will be examined to determine the usefulness of the markers in locating and confirming clandestine burials. This is based on preliminary results obtained over the past five years by IUGS-IFG members. This will improve post-mortem interval estimation to give more accurate and robust information to Police investigations and could also be used in environmental forensics (for example; illegal animal deposition). This events is proposed to take place in 2017.
8.6  JUNE

8.6.1  Geological Society of London, (EMRG) & BGS, Nottingham, UK

On 14th June 2016, an outreach presentation was given to the Geological Society of London, East Midlands Regional Group (EMRG), at the British Geological Survey, in Keyworth, Nottingham, on; ‘Forensic Geology: The Applications of Geology to Crime, Police and Law Enforcement’.

8.6.2  An Garda Síochána Headquarters, ICLVR, Dublin, Ireland

On 2nd June 2016, five members of the IUGS-IFG committee attended a meeting at An Garda Síochána (the Irish Police) Headquarters, in Dublin, Ireland, to discuss ground searches for burials with the Independent Commission for the Location of Victims’ Remains (ICLVR).

8.6.3  Meeting of IGI and GSI, Dublin, Ireland

On 2nd June 2016, IUGS-IFG delivered a series of multi-disciplinary presentations on forensic geology to the Institute of Geologist of Northern Ireland (IGI) and Geological Survey of Northern Ireland (GSI). This was attended by over 100 delegates and included an overview of forensic geology, geological searches for burials, GIS and geometrics, soil forensic and QemScan. Numerous case studies were also presented. It was attended by An Garda Síochána and members of the ICLVR.

8.6.4  Forensic Geology and BAHID, Dundee, Scotland

IUGS-IFG was represented at the British Association for the Identification of Human Remains (BAHID) Conference, held on 10th to 11th June 2016. This included the potential contribution of geological (trace) evidence to enable the provenance and identification of human remains.

8.6.5  Forensic Canines Detector Dogs

The deployment of detector dogs can be an important asset for ground searches and in particular to locate shallow, unmarked, homicide graves and other buried items. This is often based on the odour discrimination abilities of the dog and a specially trained handler. Geological and other environmental factors are envisaged to control the ability of a detector dog, although this is under researched. A knowledge exchange workshop to discuss the use of canines in forensic investigations has been proposed to take place in Spain, in April 2017. IUGS-IFG will collaborate with specialised Police canine handlers and an FBI canine trainer. The objective is to collate know facts, relevant research and operational canine outcomes to provide comprehensive proof of proficiency concepts and assist in the identification of appropriate testing protocols.

8.6.6  Forensic Geology in Japan

IUGS-IFG was represented at the, ‘26th Symposium on Geo-environments and Geotechnics’. This was, organized by the Japanese Society of Geo-pollution Science, Medical Geology and Urban Geology, and co-organized by several other organizations including IUGS-IFG.

8.7  JULY

8.7.1  SWGGEO, Phoenix, Arizona, USA

IUGS-IFG committee members continued to support Scientific Working Group for Geological Materials (SWGGEO) and attended a board meeting in Arizona, USA.

8.7.2  Forensic Geology, Università degli Studi di Messina, Sicily, Italia

Following on from the training provided by IUGS-IFG in 2015, a forensic geology training session was endorsed by IUGS-IFG in Messina, Sicily. The attendees comprises forensic geology students, police officers and lawyers. The course provided training on crime scene examination, sample collection and ground searches.
8.7.3 University of Leicester, Department of Geology, BSc Module Support, UK

IUGS-IFG provided a module on, ‘Geoforensics’ for the University of Leicester, Department of Geology. This followed on from a series of past forensic geology lectures provided for BSc (Hons) Geology students.

8.7.4 11th GeoENV, Lisbon, Portugal

IUGS-IFG was represented at GeoENV 2016, from 6th to 8th July, in Lisbon, Portugal. GeoENV conferences have been held biennially at across Europe since 1966. The objective was to bring together research from hydrogeology, biology, soil sciences, air pollution or ecology and other fields, including forensic geology (soil forensics).

8.8 AUGUST

8.8.1 5th European Meeting on Forensic Archaeology (EMFA), Dublin Castle, Ireland

On 11th August 2016, IUGS-IFG took part in the, ‘5th European Meeting on Forensic Archaeology’. A presentation was given on, ‘Geological Changes at Homicide Graves and the Influence on Search Strategies’. This received significant positive feedback from the conference chair. This event was organised by a Consultant Forensic Scientist & Investigator working with the Association for the Identification of Victims Remains, and it was supported by The European Network of Forensic Science Institutes (ENFSI), Forensic Science Ireland (FSI) and the Geological Society of London forensic Geoscience Group (FGG).

8.8.2 Medicolegal Death Investigation Conference, Montana, USA

An IUGS-IFG committee member took part in the Medicolegal Death Investigation Conference, held in Montana, USA on 11th to 12th August 2016. The target audience for this conference was Coroners, Medical Examiners, Death Investigators and other Public Safety Officers, Forensic Scientists, Physicians, Nurses, Emergency Medical Technicians, Police Officers, and others involved with the investigation of violent, suspicious, or unexpected deaths. Presentations were delivered by Medical Examiners, Coroners, University of Montana Law Professors, Crime Scene Investigators, Bloodstain Pattern Analysts, Forensic Scientists, Attorneys and other professionals.

8.8.3 Forensic Soil Science and Geology Session, 35th IGC, Cape Town, South Africa

A seminar on, ‘Forensic Soil Science and Geology’ was held in collaboration with the, ‘5th International Conference on Criminal & Environmental Soil Forensics Soil Forensic International (SFI-2016)’, at the 35th International Geological Congress, Cape Town, South Africa. The provided a forum for geologists forensic geologists to showcase development of new sophisticated field and laboratory methods and strategies and to explore their experiences through case study analysis. Over 100 attendees were present and this included students, research scientists, serving police officers and forensic geologists. There were 3 keynote speakers, 17 presentations and 6 posters. The main themes were; search for burials; history and future of forensic soil science and geology; recent developments in forensic geology and soil and geology trace evidence.

8.8.4 Hillsborough Castle Skeleton, Northern Ireland

Hillsborough Castle is an official government residence in Northern Ireland. An IUGS-IFG committee member attended a skeleton recovery inside Hillsborough Castle. This was a medieval burial located by a geophysical survey, using ground penetrating radar, which detected the coffin.

8.9 SEPTEMBER

8.9.1 The Disappeared, Pinochet’s Dictatorship, Chile (1973-1990), UK

A delegation from Chile visited the UK and Northern Ireland to discuss, ‘Disappeared but not forgotten: the Chilean experience regarding the search, recovery and identification of victims of human rights violations occurred during Pinochet’s Dictatorship (1973-1990)’. A series of meetings took pace in
Belfast followed by a workshop held on 14th September 2016, at the University of Bradford, Department of Forensic Archaeology, UK. Presentations were provided by the Medico-Legal Department, Government of Chile and a Professor of Transitional Justice at Ulster University’s Transitional Justice Institute.

8.9.2 Geological Fakes and Fraud, South West Regional Group, University of Bristol, UK

This presentation was given for the South West Regional Group (SWRG) of the Geological Society of London, at the University of Bristol, Department of Geology, on 21st September 2016. This focused on substitution cases, mining scams, fake fossils, hydrocarbon, archaeology (Piltdown Man and the Bosnian Pyramids), art fraud and historic fraud.

8.9.3 ANZFSS, Auckland, New Zealand

IUGS-IFG was well represented at the, ‘ANZFSS 23rd International Symposium on the Forensic Science’, Auckland, New Zealand, from the 18th to 22nd September 2016. The conference was focussed on, ‘Together Informing Justice’. A keynote and numerous oral and poster presentations by IUGS-IFG committee members. These presentations focused on soil evidence, decomposition and post-mortem interval estimation and diatom analysis.

8.10 OCTOBER

8.10.1 Forensic Geology and Chartered Institute for Archaeologists (CIfA)

This event was organized by the Forensic Archaeology Special Interest Group and the Chartered Institute for Archaeologists (CIfA). The workshop was held on the main city campus of the University of Bradford, Department of Forensic Archaeology, UK, on Saturday 22nd October 2016. IUGS-IFG were invited to take part in this joint event. This was a combined forensic case study and workshop session and was offered as a Continuing Professional Development (CPD) training event. The forensic case study was delivered by a professor and defense lawyer involved to the Pickton Farm multiple murder case. This was followed by a workshop delivered by IUGS-IFG on the use of RAG (Red-Amber-Green) prioritization maps to assist with open area ground searches for burials.

8.10.2 Institute of Forensic Science, Ministry of Public Security, China

China is a country IUGS-IFG has been targeting for number of years in terms of developing forensic geology. IUGS-IFG committee members visited China in 2014 and 2015 to develop opportunities. Three members of the China Institute of Forensic Science were identified to become affiliated to IUGS-IFG, via the Geoforesnic International Network (GIN). In Cape Town, in August 2016, IUGS-IFG held a meeting with Prof Guo Hongling and two of her colleagues from the Institute of Forensic Science, Ministry of Public Security, Division of Trace Evidence Analysis, China. Prof Hongling works closely with the Police and she has been granted permission to formally engage with IUGS-IFG. To-date they have been involved with about 30 cases requiring soil and mineral examinations. Police ground search seems to be under developed in China. Prof Hongling was assigned to the IUGS-IFG committee in December 2016 as the Officer for China.

8.10.3 Contributions at the 18th International Forensic Science Symposium, Interpol, Lyon, France

An IUGS-IFG member was invited by Interpol to attend a meeting of over 200 lab managers, police officers, Interpol agents, forensic scientists and university researchers from all over the world which was held in Interpol, Lyon, France, from 11th to 13th October. She was invited to discuss global developments in forensic science over the last three years as a paper, and an oral presentation of example case work. In addition, a poster on the work on the IUGS IFG group internationally was presented. Other invited presentations covered the topics of firearms, GSR, geology, fibres, wildlife forensics, counterfeiting, forensic chemistry, toxicology, DNA Next Generation Sequencing and Rapid DNA. Speakers had travelled from the FBI, NFI and AFP. A Chief Prosecutor, International Criminal Court gave a conference overview where she stressed the need to deliver robust evidence to
help international courts bring perpetrators to justice, including in war crimes. Transnational crime, Interpol forensic unit development and improved methods of human identification was also discussed. The Interpol General Secretariat provided an update on developments at Interpol with interest particularly in provenancing. The presentations attracted much interest with many countries never having used geology in case investigations. Invitations to work with police practitioners and associated university academics were received from Greece and Portugal. The IUGS IFG member was invited back to present in three years time on developments over the period 2016-2019.

8.10.4 Field Portable Xray Fluorescence (FRXRF), JM & QUB UK1,11

In collaboration with a PhD research project being undertaken at John Moores University (JM), in Liverpool, experimental FPXRF field testing was carried out at a remote location where homicide graves were previously found. The instrument used was the Genius 9000 XRF (SkyRay instrument), which was designed to look for heavy metal contamination in soils. This included a control test to establish a baseline, a seeded test to check the instrumentation was operational detecting the material and a blind test area with known leachate plumes. There were five elements of interest when investigating decomposition (Ca, Fe, Mg, K and P). Experimental testwork will continue into 2017.

8.10.5 Experimental Ground Penetrating Radar, Mala & QUB, UK & Ireland1,11

In collaboration with Mala UK, sophisticated GPR was tested over a control site, in a remote moorland setting in the north of England, as part of an ongoing search for a homicide grave. The GPR was able to detect and image the buried targets, which were previously not detectable using GPR. This is thought to have been successful owing to the advancements in GPR technology and changes in the engineering geological properties (eg. cohesion, moisture, density, strength, permeability, porosity) of the reinstated soils above the burial. These results have positive implication for a search of an unmarked, shallow grave, in similar geological conditions.

8.11 NOVEMBER

8.11.1 Universidad de Antioquia y Tecnológico de Antioquia, Medellin, Colombia16

IUGS-IFG was represented at the, ‘International Seminar: Lowlands and Floodplains: Taphonomy Archaeological and Geophysics’. This was held at the Universidad de Antioquia y Tecnológico de Antioquia, Medellin, Colombia, on 1st to 3rd November 2016. IUGS-IFG was particularly interested in the influence of human decomposition and preservation for the use of geophysics during the search for homicide graves.

8.11.2 CAC & ASTEE joint Seminar, California, USA4,15

A Forensic Soil workshop for field investigators was hosted in California by two IUGS-IFG committee members to assist with the program for, ‘The California Association of Criminalists (CAC)/American Association of Trace Evidence Examiners (ASTEE) joint Seminar.’ Excellent feedback was provided and the workshop may be featured on the cover of the next CAC News.

8.11.3 Forensic Geology, Universities of Camerino and Verona, Italy18

Buildings at the Universities of Camerino and Verona suffered structural damage as a result of the earthquakes in August 2016. Due to these circumstances a decision was taken to temporarily suspend a proposed postgraduate master courses in forensic geology. The universities that we will be ready to support this in the future when the challenges and difficult time period has passed.

8.12 DECEMBER

8.12.1 National Crime Agency, Preliminary Discussions with the New National Search Adviser1

On 6th December 2016, a meeting was held with the UK Police National Search adviser to discuss future collaboration with respect to the search to locate graves and other items related to homicide serious organised and counter terrorism searches for burials.
8.12.2 Brazilian Federal Police, Curitiba, Brazil\textsuperscript{1,16,17,18}

On 12\textsuperscript{th} to 15\textsuperscript{th} December 2016, the Brazilian Federal Police, along with the Federal University of Paraná, the Policia Cientifica of Paranà, the National Association of Federal Criminal Consultants, and the Brazilian Association of Criminalistic organised the, ‘2\textsuperscript{nd} Colóquio sul Brasileiro de Pesquisas em Ciencias Forenses’, held at Curitiba, Paraná, Brazil. This date was chosen to coincide with the conference, ‘VI Seminário Nacional de dna e lLaboratórios Forenses, and Colóquio Sul-Brasileiro de Pesquisa em Cências Forenses.’ IUGS-IFG provided an overview of the objectives, governance and global achievements of IUGS-IFG. This event included numerous sessions enable to deal with many application of forensic science, and it was attended by over 500 participants. At the event, IFG officers for Europe and Latin America represented IUGS-IFG and delivered a training on Forensic Geology. The training consisted in three sessions, for a total of four hours, and was attended by about 30 participants, from Academy (students and professors) and Law Enforcements (officers and forensic scientists).

8.12.3 Planning, 3\textsuperscript{rd} Iberoamerican Seminar on Forensic Geology, Argentina\textsuperscript{1,16,17,18}

In Brazil, UK, Northern Ireland and Italy, IUGS-IFG continued with planning and preparations for the ‘3rd Iberoamerican Seminar on Forensic Geology’, which is proposed to be held in Argentina in December 2016. This is proposed to be held in, Cordoba or La Plata, Argentina in December 2017. This will be held in association with South American Law Enforcement organisations. The involvement of IUGS-IFG at this event is considered to be crucial for the further developments of Forensic Geology in Latin America, especially for those countries where Forensic Geology is not already applied including for example; Peru, Chile, Bolivia, Venezuela, Ecuador, Uruguay, Paraguay, and the Caribbean. IUGS-IFG committee members was involved in the 2\textsuperscript{nd} and 1\textsuperscript{st} of these events in Brazil (2013) and Colombia (2009), respectively. This may also include a visit to Santiago, Chile, to discuss the search for missing persons and graves.

8.12.4 TV Interview on Forensic Geology, Rome, Italy\textsuperscript{18}

In December 2016 the IUGS-IFG Officer for Europe arranged to give an interview on the Italian TV Channel, Tele Roma Uno, with a geophysicists from the American University of Rome. This was for the TV program ‘Missing’, where the efforts of IUGS-IFG was explained including the developing forensic geology and its best practice.

8.12.5 Geological Society of London, Forensic Geoscience Group\textsuperscript{1,11}

December 2016 marks the 10\textsuperscript{th} anniversary of the establishment of, ‘The Forensic Geoscience Group (FGG) of The Geological Society of London (GSL)’. This is the newest of the Geological Society’s 23 Specialist Groups and Joint Associations. It was established in December 2006 to develop forensic geology in the UK. This group led to the formation of IUGS-IFG in 2011. To celebrate the first decade of FGG an article was published in ‘Geoscientist’ (The journal of The Geological Society of London).

8.12.6 International Union of Geological Sciences, Episodes\textsuperscript{1-29}

IUGS-IFG has prepared a draft manuscript for the publication of a themed issued of Episodes (Journal of the International Union of Geological Sciences) on forensic geology. The expected contents are as follows:

- Section 1: Introduction and the International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG)
- Section 2: Searching the Ground for Graves and Buried Items Related to Homicide, Terrorism and Organised Crime
- Section 3: Global Developments in Forensic Geology
- Section 4: The role of Forensic Geology in Illegal Precious Trade
- Section 5: Application of Application of Geographic Information System (GIS) in Forensics Geoscience
- Section 6: Forensic Geoscience and Biomarkers
- Section 7: Use of Geological Trace Evidence for Geolocation
- Section 8: Geology of the FBI Lab and the Challenge to the Admissibility of Forensic Geology in US Court
- Section 9: International Case in Forensic Geology; Fakes, Fraud, Homicide and Environmental Crimes

8.12.7 Forensic Geology and The Media\textsuperscript{1,3,11,16,18}

Throughout 2016, IUGS-IFG collaborated with the media and as a result numerous TV, radio, popular press and web sites articles were produced. A selection of these can be seen in appendix I.

8.12.8 Forensic Geology and Crime Fiction\textsuperscript{1,3,11,18}

Forensic science and geology continue to attract attention from writers of Crime Fiction. IUGS-IFG has provided advice to a number of crime novel authors. This has included contribution to Lin Andersons recent novel, ‘None but the Dead’ (as A forensic geoscientist) and to advise on BBCs TV programme, ‘Silent Witness’.

8.12.9 Discussions with ENFSI (European Network of Forensic Science Institutes)\textsuperscript{3}

Attendance at annual meeting and the development of common laboratory practices in forensic geoscience and soil science.
9  MAIN PRODUCTS AND OTHER SERVICES IN 2016

9.1  Confidential Documents and Operations

IUGS-IFG committee members were contacted by the Police to provide advice, guidance and assistance with operational cases related to homicide, sexual crimes, environmental crimes, searches for graves and other items associated with organised crime and counter terrorism. Due to their confidential status details are not contained in this annual report.

9.2  Training Documents

IUGS-IFG produced power point presentations and information for training courses held in Scotland, Sicily and Brazil, which included IUGS and IF logos

9.3  Website

Due to the expansion of IUGS-IFG, it was proposed at the committee meeting in Cape Town for the website to be hosted by a different provider, which is expected to take place in 2017. The website contains information on forensic geology including details of the IUGS-IFG committee, history, past, recent and future global events, contacts, papers, publications and popular press articles.

9.4  Flyer

The IUGS-IFG flyer was updated in 2016 and where appropriate it was issued around the world.

9.5  Geoforensic International Network (GIN)

GIN brings together forensic geologists, geoscientists and police/law enforcement officers from around the world to develop and promote forensic geology.

Those countries now represented in GIN include; Australia, Argentina, Belgium, Brasil, Canada, China, Colombia, England, France, Germany, Hungary, India, Iran, Ireland, Italy, Japan, Malta, Mexico, Namibia, New Zealand, Nigeria, Northern Ireland, Portugal, Russia, Scotland, South Africa, Spain, Sweden, Switzerland, Netherlands, United Arab Emirates, United States of America, Wales and the West Indies (Caribbean). Targeted countries for potential membership: Belarus, Greece, Kazakhstan, Kyrgyzstan, Kuwait, Mongolia, Oman, Qatar, Poland, Venezuela, Malaysia and African Countries.

9.6  War Graves

A new member for Canada became a member of GIN following a geophysical survey at various sites for a holocaust archaeology project. As part of this work they located a mass grave and mapped the location of an escape tunnel at the Ponary mass execution site, where up to 100,000 people (mostly Jews, and a number of communists and political dissidents) were executed by Nazi and Lithuanian death squads.

9.7  Police Recruitment Support

IUGS-IFG assisted the Australian Federal Police (AFP) with expressions of interest for an opportunity with AFP Forensics, Soil Capability Implementation. This was to assist with the further development and implementation of a provenancing capability within its forensics portfolio and soil examinations. This included validated methods for the comparison of soils using micro-spectrophotometry, infrared spectroscopy and elemental analysis, however requires further development and implementation for provenancing examinations utilising mineralogical examinations, XRD analysis and mapping.

IUGS-IFG supported Abu Dhabi Police following their request for the identification of a suitably qualified and experienced forensic geology to join the Abu Dhabi Police, Forensic Geology Group. IUGS-IFG was able to identify suitable candidates from around the world whose details were forward on to Abu Dhabi Police for their consideration.
9.8 Certificates
IUGS-IFG certificates were issued to delegates who attended forensic geology training in Scotland, Sicily and Brazil. As noted above, an IUGS-IFG certificate was awarded to Prof Rob Fitzpatrick for his significant global contributions to forensic geology. An IUGS-IFG ‘Best Student’ award certificate was also presented to Jennifer Young.

9.9 Newsletter
IUGS-IFG published the third newsletter in June 2016, which was subsequently issued and circulated globally.

9.10 Publications
A list of publications by IUGS-IFG and/or including IUGS-IFG committee members and related articles are presented in Appendix I.
10 **MAIN PROBLEMS ENCOUNTERED IN 2016**

10.1 **Funding: A Principal Leadership Challenge**

IUGS-IFG was successful in attracting funding and funding in kind throughout 2016, however the core funding provided by IUGS remains critically important for the continued success and growth of this Initiative.

10.2 **Competence, Accreditation, Regulation and Code of Conduct**

There is no internationally recognised professional body for the accreditation of forensic geologists. This continues to be an important debate and discussion within IUGS-IFG.

10.3 **Alignment with Forensic Science**

IUGS-IFG are progressing the alignment of forensic geology with forensic science.

10.4 **Security and Geopolitics**

IUGS-IFG continues to not be active in some parts of the world where security risks remain high.

10.5 **Confidentiality**

Due to the sensitive and often high profile nature of forensic geology it is not always possible to publish or discuss some aspects of forensic geology.

10.6 **Publications**

IUGS-IFG continue to receive regular request for publications in forensic geology for scientific literature, commercial text books, popular press magazines and web sites.

10.7 **Law Enforcement Relationships**

IUGS-IFG committee members have development excellent relationships with Police and Law Enforcement officers. It is common in many forces for offers to rotate their positions every 3 to 6 years, which means the forensic geologist has to start again developing new relationships.

10.8 **Media**

Managing the media and journalist that seek information on operational cases of forensic geology strategies continues to be challenging for some IUGS-IFG committee members.

11 **SUMMARY OF EXPENDITURES IN 2016**

11.1 **Bank Account & Management**

The IUGS-IFG bank account remains in Aberdeen, Scotland, and is managed by the IUGS-IFG Treasurer.

11.2 **Summary of Accounts**

The income and expenditure on the account for 2016 is summarised in Table 10.1. As the IUGS-IFG bank account is held in the UK, the income and expenditure is shown in £ sterling and $USD equivalent.
The objectives for 2017 and beyond are to implement recommendations for the IUGS ARC, including the following:

i. Expand the committee;
ii. Engage with new technologies;
iii. Attract new audiences and increase the diversity of membership and opportunities for all wishing to access IFG, particularly young people, those from ‘harder to reach’ communities and developing nations;
iv. Develop relationships and engage with other IUGS Task Groups and Initiatives;
v. Enhance accessibility to IFG materials through translation and distribution internationally;
vi. Include collaboration with other specialist groups in police and law enforcement, such as archaeology ecology and provide blended training;
vii. Promote engagement with forensic science regulators in the UK;
ix. Develop the IUGS-IFG web site and enhance visibility; and
x. Establish an ‘excellent in research framework’ and support via a peer review network.

In addition, IUGS-IFG propose to implement the following throughout 2017 (subject to approval and confirmation):

i. Produce guidance regarding the application of forensic geology to police and law enforcement investigations;
ii. Publish a themed issue of forensic geology in ‘Episodes (Journal of the International Union of Geological sciences);
iii. Provide outreach, knowledge transfer and capacity building, and training in forensic geology;
iv. Expand and diversify to include environmental forensics, geotechnical forensics, geohazards, fakes and fraudulent crimes;
v. Enhance further public and media exposure;
vi. Where possible, continue to use the IUGS logo on materials published.
vii. Collaborate with the Geological Society of London, Corporate Affairs Committee (January 2017);
viii. Participate in, ‘Sharing an Uncertain World: Lessons in Managing Risk: Managing Risk in Forensic Geology’ at the Geological Society of London (July 2016);
ix. Forensic geology event, Belfast, Ireland (February 2017);
 x. Collaboration with Australian Taphonomy Experimental Research (AFTER) and in particular the influence of geology on human decomposing and leachate plume detection.
xi. Continue engagement with schools and the general public to raise awareness of the applications of forensic geology;

xii. Provide training the UK Police in ground searches for burials associated with homicide, organised crime and counter terrorism;

xiii. Provide training for the South Africa Police Force (SAPS);

xiv. Developing forensic geology in China, following the elevation of Dr Hongling from GIN member to IUGS-IFG committee member;

xv. Outreach to Asia and Africa;

xvi. Provide support for forensic geology courses at BSc and MSc level;

xvii. Support for PhD research in forensic geology;

xviii. Support the Victim Detector Dog (VDD) workshop in Spain (April 2017);

xix. Provide forensic geology training for the Abu Dhabi Police, UAE (October 2017);

xx. Support the 4th International Conference on Engineering Geophysics, session on Forensic Geophysics and Environmental Forensics, Al Ain, UAE (October 2017);

xxi. Continue research to the generation, migration and detection of volatile organic compounds (VOCs) and leachate plumes too help locate homicide graves;

xxii. Support the 3rd Iberoamerican Course on Forensic Geology, planned to be held in, Cordoba or La Plata, Argentina (December 2017);

xxiii. Collaborate with authorities in Chile regarding victims of human rights violations that occurred during Pinochet’s Dictatorship (December 2017);

13 Critical Milestones

Critical milestones for 2016 included the following:

- Successful completion of the IUGS Ad Hoc Review;
- Provided benefits for IUGS including high profile global recognition, raised public, political, media and police awareness;
- IUGS-IFG remains non-political, non-governmental, impartial and on-profit making;
- The advancement of forensic geology in teaching to school children from 8 to 18 years old, and at universities at BSc, MSc and PhD levels;
- The provision of publications of information on forensic geology
- Advancement of the draft on ‘A Guide to Forensic Geology’ and agreement for this to be published by The Geological Society of London;
- Successful organisation of the forensic geology session at the 35th IGC in Cape Town attended by over 100 delegates; and
- Provision of forensic geological support for several serious crimes.

14 Anticipated Outputs To Be Achieved For 2017

The main outputs expected for 2017 include the following:

- Finalise the draft of, ‘A Guide to Forensic Geology’;
- Publication of a themed issue of forensic geology in ‘Episodes’;
- Publication of an article on forensic geology in ‘Geoscientist’ (completed in December 2016);
- Delivery of further training, knowledge transfer and outreach events;
- Update of the IUGS-IFG web site;
- Implementation of the ARC recommendations; and
- Publications and marketing of IUGS-IFG.

15 Budget For 2017

In 2016, IUGS-IFG was successful in attracting additional financial support to assist with international events IUGS-IFG will continue to request and obtain contributory funding and funding services in-kind, however this relies on the core funding that is provided by IUGS. This approach is expected to provide
a basis and for the continued global development and advancement of forensic geology. In 2017, IUGS-IFG proposes to generate a small surplus for events in 2018 or to break even.

IUGS-IFG would request that we can ‘roll forward’ the current balance of GBP.

IUGS-IFG kindly requests the maximum available budget of USD$15,000 funding from the IUGS Executive Committee for 2017 so the Initiative can deliver the recommendations provided by the IUGS ARC and proposed 2017 programme.
APPENDIX I: SELECTED PUBLICATIONS IN 2016
The list below includes information on forensic geology authored or co-authored by IUGS-IFG committee members. This list also includes publications not authored by IUGS-IFG committee members on forensic geology, forensic geoscience and related fields.

Books, Book Chapters and Monographs


Papers, Published and Refereed Articles, Reviews


Selected Conference Paper


Selected Popular Press, Web Sites, Media Articles, TV, Radio


42. MSc University of Messina, Sicily, Italy:
   iii. Sito web ufficiale: http://web.unime.it/unigeolab/pagine/-15696.html


44. https://www.westpark.co.uk/conference-centre

45. University College London: https://blogs.ucl.ac.uk/forensic
   https://www.eventbrite.ie/e/forensic


47. AFTER: More than 40 interviews have been conducted in 2016, these include the following:

48. Holocaust war Graves, Lithuania
   i. http://www.pbs.org/wgbh/nova/next/military/vilnius-tunnel/

49. 35th International geological Congress, Cape Town, South Africa

   Soil Forensic Seminar, 35th IGC, Cape Town, South Africa: http://www.35igc.org/Themes/6/Soil-Science

A. Presentations:
   i. Successes and Failures in Detecting Buried Non-metallic Objects Using Ground (and Water) Penetrating Radar. Dr Alastair Ruffell (WPR and GPR).
   iii. Analysis of leachate, VOCs, fatty acids and mineralogy following the discovery of a homicide grave: Potential implications for police led open area ground searches for burials. Dr Laurance Donnelly.
   v. The Importance of the Field of Forensic Soil Examination being Aligned with the Wider Discipline of Forensic Science, Prof Hilton Kobus.
   vi. Geological Society of London (GSL), Forensic Geoscience Group (FFG); the first 10 years and the International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG); the first 5 years. Dr Laurance Donnelly.
   vii. Igneous Phosphate Resources of East and South east Africa Mr Wondafrash Mammo Ghebre
   viii. Predicting the origin of soil evidence: high throughput eukaryote sequencing and MIR spectroscopy applied to a crime scene scenario. Dr Jennifer Young.
   ix. Introduction to the Exploitation of Microscopic Traces for the Geo-sourcing of Forensic Soil and Dust Evidence: Methods and Examples from Casework. Mr Skip Palenik.
   x. Forensic Geophysics: ground penetrating radar application in archaeological research in Tekoha Jevy village, Parana, Brazil. Mr Fábio Salvador
   xi. Comparison of ginseng planting field soil to solve a murder case. Ms Hongling Guo
   xii. Novel use of monochromatic light mineral separation techniques to enhance agrimineral concentration for plant nutrient release from mesocratic and leucocratic fractions of Pelotas monzogranite, RS, Brazil. Mr Matheus Grecco
   xiii. Development of Chernozem – Luvisol toposequence in the North-east Namibia. Dr Vit Penizek
   xv. Prairie Mound Morphology and Age in the Arkansas River Valley, south-central United States. Dr Brad Lee.
   xvi. Estimation of Volumetric Oil Content in Unsaturated Soils using Thermo-TDR Techniques. Mr Shinsuke Aoki
xvii. Interpreting the transfer method of soil evidence on clothing by identifying trace soil patterns. Prof Robert Fitzpatrick.

xviii. Trace evidence examination using laboratory and synchrotron X-ray diffraction techniques. Mr Mark Raven.

xix. Mineralogy and forensic geology to solve a foreign trade trickery. Mr Fabio Salvador.

xx. The importance of geological and soil materials as trace evidence in solving criminal investigations in Australia. Prof Robert Fitzpatrick.

xxi. Tracing illicit gold from South America. Dr Roger Dixon.

xxii. Tracing the source of stolen PGM smelter products. Dr Roger Dixon.


xxiv. The application of forensic ecology and the use of near-surface geophysics in a search for concealed human remains. Mr Colin Hope.

xxv. Environmental magnetic studies of soil profiles from tropical Southern India: A window to pedogenic processes and sediment-source linkage. Dr Rajasekhariah Shankar.

xxvi. Ecological services and biophysical functioning of agricological soils of Burkina Faso. Prof Mikael Motelica-Heino.


xxviii. Bromine in soil. Dr Irina Shtangeeva.


xxx. Novel potash fertiliser from nepheline syenite for Africa’s agricultural growth. Mr Annock Chiwona.

xxxi. Forensic Geosciences applied to the presence or absence of a corpse. Dr Rosa Maria Di Maggio.

xxxii. Geoforensics in Italy: Education and Research Standards. Dr Rosa Maria Di Maggio.

xxxiii. Possibility of describing sand grain morphology by image analysis. Dr Ritsuko Sugita.

B. Posters:

i. Forensic Geophysics: ground penetrating radar application in archaeological research in Tekoha Jevy village, Parana, Brazil. Mr Fabio Salvador.

ii. Geophysical monitoring over graves simulated in Colombia, South America. Dr Carlos Molina.

iii. Comparison of ginseng planting field soil to solve a murder case. Ms Hongling Guo.

iv. Geoforensics in Italy: Education and Research Standards. Dr Rosa Maria Di Maggio.

v. Forensic Geosciences applied to the presence or absence of a corpse. Dr Rosa Maria Di Maggio.

vi. Possibility of describing sand grain morphology by image analysis. Dr Ritsuko Sugita.

vii. Preliminary results of a geoelectrical survey in a vineyard in Estremoz, Portugal. Dr Brad Lee.


ix. Novel use of monochromatic light mineral separation techniques to enhance agromineral concentration for plant nutrient release from mesocratic and leucocratic fractions of Pelotas monzogranite, RS, Brazil. Mr Matheus Grecco.

x. Estimation of Volumetric Oil Content in Unsaturated Soils using Thermo-TDR Techniques. Mr Shinsuke Aoki.

xi. Techniques Development of Chernozem – Luvisol toposquence in the North-east Namibia. Dr Vit Penizek.

xii. Erosion and sedimentation in the Daryan watershed, north west of Iran. Dr Javad Darvishi Khatoonii.
APPENDIX II: SELECTED PHOTOGRAPHS AND ASSOCIATED INFORMATION
Dr Ray Murray, at the Medico legal death investigation conference, Montana, USA (Photo: Dr Ray Murray)

Prof Lorna Dawson representing IUGS-IFG at Interpol, in Lyon, France, October, 2016 (Photo: Prof Lorna Dawson)

Prof Shari Forbes at the Australian Facility for Taphonomic Experimental Research (AFTER) (Photo: Prof Shari Forbes)

Experimental, simulated grave, University of Messina (Photo: University of Messina)

Students at the University of Messina, MSc in Forensic Geology (Photo: Dr Alastair Ruffell)

Prof Hongling colleagues (Institute of Forensic Science, Ministry of Public Security, Division of Trace Evidence Analysis, China) at the 35th IGC in Cape Town (Photo: Prof Guo Hongling)

Dr Carlos Molina Gallego conducting research in decomposition and search, in Colombia (Photo: Dr Carlos Molina Gallego)
IUGS-IFG Chair, at the opening of the Forensic Geology Session, 35th International Geological Congress, Cape Town, South Africa (Photo: Dr Laurance Donnelly)

Experimental deployment of field portable XRF in the vicinity of a former homicide grave (Photo: Dr Laurance Donnelly. Equipment, Ms Carole Davenport, John Moores University, Liverpool, UK)

IUGS-IFG welcome colleagues from China to the forensic geology session, 35th IGC Cape Town (Photo: Dr Laurance Donnelly)

Ground search for a burial, Northern Ireland (Photo: Dr Alastair Ruffell)

IUGS-IFG at the Geological Survey of Ireland (Photo: Dr Laurance Donnelly)

Experimental use of ground penetrating radar to over a control site associated with an unknown grave, in the north of England (Photo: Laurance Donnelly. Mala geophysical supplied courtesy of Mr Mike Langton. Geophysics support from Dr Alastair Ruffell)
University of Messina, MSc in Forensic Geology with the Polizia (Photo: Alastair Ruffell and Roberta Somma)

Geology students and police undergo endorsed and supported by IUGS-IFG, Italy (Photo: DR Alastair Ruffell and University of Messina, Sicily)
IUGS-IFG deliver training in Forensic Geology with the Brazilian Federal Police, the LAMIR, Isotope laboratory for analyses of minerals and rocks and 2nd Coloquio Sul Brasileiro en Ciencias Forenses, Brazil, December 2016 (Photo: Dr Fabio Augusto Da Silva Salvador, Dr Carlos Molina Gallego and Dr Rosa Maria Di Maggio)
Marketing flier and media reports for forensic geology training in Sicily, Italy (Source: University of Messina)
Example of flier’s for IUGS-IFG outreach events.

(Left) The California Association of Criminalists (CAC)/American Association of Trace Evidence Examiners (ASTEE) joint Seminar (Source: Ms Marianne Stam). (Right) IUGS-IFG & James Hutton Institute Poster for the meeting with Interpol, France, September 2016
IUGS-IFG development of ground search strategies for burials. The radar gram from ground penetrating radar survey in the UK Pennines was carried out above a buried spade and clothing. Note the detection of the grave cut and the control item (Source: Dr Laurance Donnelly. GPR supplied by Mala courtesy of Mr Mike Langton and supported by Dr Alistair Ruffell. Submitted for publication in Episodes)
International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG)

The Geological Society of London, Forensic Geoscience Group (FGG)

Acknowledges the contribution made by

Symposium: Forensic soil science and geology; 5th International Conference on Criminal & Environmental Soil Forensics, Soil Forensic International (SFI-2016)
35th International Geological Congress,
Cape Town, South Africa 27 August 2016 to 4 September 2016

Dr Laurence Donnelly, Chair IFG
Dr Jamie Pringle, Chair FGG
Dr Alastair Ruffell, Training FGG

The International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG)

Acknowledges the support and contributions from

Rosa Maria Di Maggio
For the organisation and participation in the

Training in Forensic Geology
with the
Brazilian Federal Police

held at
2nd Colóquio Sul Brasileiro de Pesquisas em Ciências Forenses, Curitiba, Brazil
Monday 12th to Thursday 15th December 2016

Dr Laurence Donnelly
Chair, IUGS-IFG

Dr Rosa Maria Di Maggio
IUGS-IFG, Europe

Mr Fabio Augusto Da Silva Salvador
IUGS-IFG, Latin America

Dr Carlos Molina Gallego
IUGS-IFG, Latin America

Examples of IUGS-IFG certificates
The International Union of Geological Sciences (IUGS), Initiative on Forensic Geology (IFG), was officially launched during the 62nd Executive Committee Meeting of the IUGS, which was held at UNESCO headquarters, in Paris, France, on 22nd February 2011. The objectives of the IUGS-IFG are to:

- Collect and disseminate data and information on forensic geology applied to policing and law enforcement, criminal, environmental and civil investigations;
- Promote international meetings, seminars, conferences and training;
- Develop a Committee to act as principal advisers, collaborators and active participants;
- 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;
- Collate, make available and where appropriate review any existing documentation and publications in forensic geology; and
- Produce a document endorsed by the Committee to be called, ‘A Guide to Forensic Geology’.

IUGS-IFG with staff and delegates from the MSc in Forensic Geology, University of Messina, Sicily, Italy (Photo: Università degli Studi di Messina)

IUGS-IFG COMMITTEE

The IUGS-IFG Committee comprises representatives from major geographical regions of the world and includes specialists from academia, industry, consultancy, operationally based forensic geologists, the police, law enforcement agencies and forensic organisations. In 2015, three new members were assigned to the IUGS-IFG Committee: Dr Duncan Pirrie, Special Publications Adviser; Dr Ruth Morgan, Forensic Science Adviser and Mr Fabio Augusto Da Silva Salvador, joint Co-Officer for Latin America

IUGS-IFG GEOFORENSIC INTERNATIONAL NETWORK (GIN)

The GeoForensic International Network (GIN) brings together forensic geologists, geoscientists and invited police/law enforcement officers from around the world, who have a desire and interest in the development of forensic geology. New contacts have been provided for potential members in: Belarus, China, Kazakhstan, Kyrgyzstan, Kuwait, Mongolia, Oman, Qatar, Poland and Venezuela. Countries now represented in GIN include: Australia, Argentina, Belgium, Brazil, Canada, Colombia, England, France, Germany, Hungary, India, Iran, Ireland, Italy, Japan, Latvia, Malta, Mexico, Namibia, New Zealand, Nigeria, Northern Ireland, Portugal, Russia,
For further information
http://www.forensicgeologyinternational.org or http://www.forensicgeologyinternational.org

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