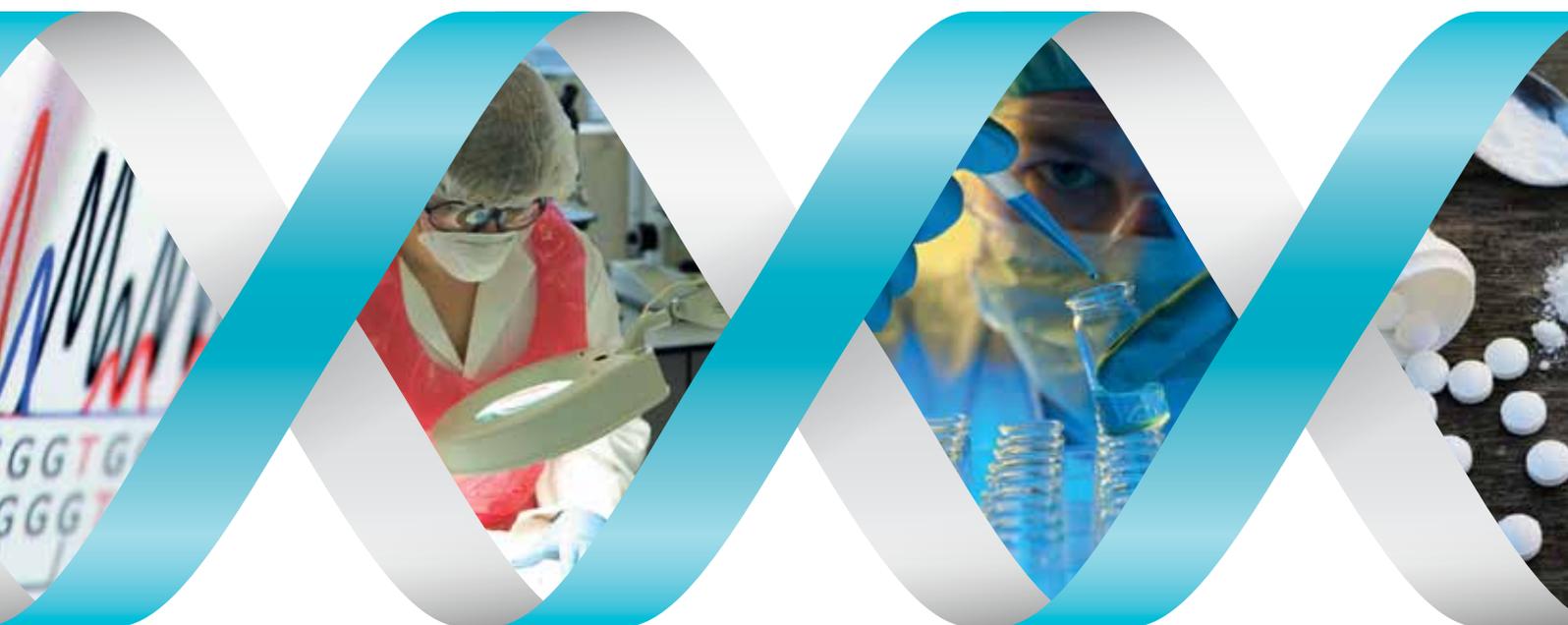


# fsi

forensic science ireland



**ANNUAL REPORT 2016**

## Foreword

**This is the first report produced under my obligation set out in the 2014 DNA database Act. Because the operation of the database in legislation, and more especially in practice, is inextricably linked with the overall operation of Forensic Science Ireland (FSI), the report is laid out as an update on the FSI statement of strategy 2015-2018.**

Excellence in science and the provision of a good service is the corner stone of the operation of FSI. In spite of pressure on resources, FSI worked closely with An Garda Síochána (AGS) to ensure that real time results were available to aid ongoing investigations in high profile cases. This involved examining large seizures of Drugs as well as providing results of DNA examinations and more traditional areas such as firearm residue and footwear comparisons.

Operationally, the DNA database has been a big success and it was also shortlisted for the Taoiseach's award. Its success is evidenced by the reality that each time a crime stain from an unsolved crime is added to the database, there is a one in five chance that it will match with a profile on the database. In 2016 alone, 9,000 profiles from persons were added to the database and the initial uptake has been greater than that experienced in other countries. Further details are outlined in the final section of the report.

Through all this FSI continued to focus on the supportive culture initiative and were proud to be the recipient of the Excellence through People award at the IITD annual ceremony.

2016 also marked one year in operation of the new Laboratory Integrated Management System (LIMS). Its development will give efficiency and assurance in future particularly with the high volume throughput of

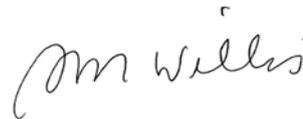
the database where extensive IT investment is needed to ensure we are in a position to fulfil EU commitments to share data with other member States.

Development cannot stay still in a science environment if we are to meet the challenges. YSTRs, a male only DNA profiling system was validated for casework and many new psychoactive substances identified in 2016. FSI's contribution to the body of forensic science knowledge is seen in the published papers and presentations delivered as outlined in the report.

For many years the unsuitable nature of the existing premises have been a concern for me. It is heartening to see the renewed efforts of the Tánaiste in bringing forward the plans to provide a state of the art facility at Backweston. The money was made available to commence the project in 2017 so that it may be finished in 2019/2020 rather than commence in 2019, as originally planned.

I am very grateful to the staff of FSI who are responsible for our success and to the various people with whom we interact to provide a service to the criminal justice system-Gardaí, Department of Justice and Equality officials, prosecution and court officials.

This is the first annual report under the new database legislation and my last report before I retire. I am proud of the work of FSI and wish all staff continued success for the future.



Dr Sheila Willis  
Director General FSI

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## Excellence in Science

The report identifies ways in which FSI delivers a quality forensic science service and continues to grow and develop, both science and staff to ensure that we are operating to international standards.

## Customer Service

FSI interacts with a range of stakeholders. The Gardaí are the main front line customers and the service supplied to them is outlined as defined in the service level agreement. All the work is carried out mindful that any of it could be needed in criminal court cases and some information on cases from 2016 is included.

## Modern Organisation

All forensic science is dependent on technology and this was never as evident as when the DNA database begun

operations. It coincided with the implementation of a Laboratory Information Management System (LIMS). A purpose built facility suitable for a 21st century forensic science institute is a key goal and in 2017 six million euro was allocated by the Tánaiste to commence the project and bring back the time line to allow completion in 2019/2020. The modern HR practices were validated by winning the excellence through People award sponsored by IITD (Irish Institute of training and Development) in early 2017.

## DNA database

The implementation of the DNA database is one of the most important crime fighting tools introduced within the State in recent times. The final section of the report outlines the success of its operation in the first fifteen months.

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## Introduction

**FSI is an associated office of the Department of Justice and Equality. The people working at FSI are scientists and analysts trained in forensic testing and reporting techniques supported by administration staff and number close to one hundred. We work together to deliver to best international standards, independent expert opinion, advice, training and research to support the Irish criminal justice system.**

Originally known as the Forensic Science Laboratory, FSI was established in 1975 to provide a scientific service to the criminal justice system by analysing samples submitted from crime scenes and providing expert evidence in criminal trials. Forty years later some of the original staff are now leading today's FSI team as we embrace the ever-increasing advances in forensic science and continue to fulfil that remit.

Under the Criminal Justice (Forensic Evidence and DNA Database System) Act 2014, FSI are the custodians of the DNA Database System and responsible for the establishment and operation of the System.

At the time of writing the database has been in operation for fifteen months so in effect this is the first annual report of the newly constituted FSI.

FSI is currently based in Garda Headquarters in the Phoenix Park but plans to build a new fit-for-purpose building on the scientific campus at Backweston, Celbridge are well advanced. This re-location to suitable facilities will allow FSI continue to develop its scientific remit in order to achieve its stated vision of "Science Supporting Justice".

FSI was also a founding member of the European Network of Forensic Science Institutes (ENFSI) in 1995. Our members are active on all the relevant ENFSI working groups and in recent years have contributed to some of the EU funded ENFSI Monopoly projects. ENFSI was granted Monopoly funding status by the EU in 2009 and they have used this funding to address best practice issues across the discipline of forensic science.

In addition to our role within the Irish justice system, we have also always been conscious of our responsibility to contribute to the global knowledge base. So, while the FSI is very much a working service laboratory, our staff are encouraged to contribute to scientific conferences and publish their work.

FSI is accredited according to ISO17025 and, through the efforts of its dedicated staff, holds an Excellence through People certification. In February of this year, FSI was awarded a national IITD award recognising its efforts to promote a supportive workplace culture.

## Our Management Team



Dr Sheila Willis  
Director General FSI



Dr Louise McKenna  
Director of Science



Dr Sean McDermott  
Director of Services



Dr Geraldine O'Donnell  
Director of DNA



Dr Tom Hannigan  
Director of Chemical  
Sciences

### Our Staff

FSI is a knowledge based organisation and the expertise of the staff is its most valuable attribute. Its functioning is an excellent example of the practical application of science in Ireland. Our scientific staff are qualified in a range of scientific disciplines, mainly Chemistry and Molecular Biology, many of them to Masters or Ph.D level. Our staff use science in the investigation of crime. The nature of science results in ongoing change and consequently FSI places a significant emphasis on ongoing education and development. This is vital in ensuring that the criminal justice system has the benefit of international best practice.

### Our Service

FSI contributes to both the investigation and adjudication of crime within the Irish criminal justice system. In broad terms investigations examine work recovered from crime scenes and uses various techniques to link suspects and victims and suspects and scenes. This frequently leads to the elimination of suspects from investigations and there are few major criminal trials that do not feature some contribution from FSI.

The area of most sustained growth is DNA, which is also the discipline of greatest ongoing development. In the DNA area, DNA profiles are extracted from submitted items and compared with reference profiles obtained from suspects to assist the investigation of crimes, ranging from burglaries to sexual assaults and murder. Blood Pattern Analysis (BPA) and examination of damage to clothing is also carried out.

In the Chemistry area, many types of trace evidence are recovered and compared with reference samples e.g. glass, paint, fibres, firearm residue (GSR). Marks and impressions are also examined e.g. footwear impressions left at crime scenes or manufacturing marks on plastic bags. Debris samples from suspicious fires are analysed for accelerants (e.g. petrol) and suspect materials are analysed for explosives. Chemistry contains the greatest variation in types of materials encountered and the discipline where the greatest diversity of knowledge is needed.

The analysis of materials thought to contravene the Misuse of Drugs Acts constitute the highest number of submissions to FSI. The increase in the abuse of New Psychoactive Substances puts additional pressure in this area where the analysis of new materials poses analytical challenges.

The bulk of cases for FSI analysis are submitted by An Garda Síochána (AGS) but material is also received from Garda Síochána Ombudsman Commission (GSOC), Customs & Excise, and Military Police. Cases are accepted by FSI reception/ case intake staff who ensure that items are safely and securely stored or passed directly to a scientist depending on the situation. In either situation the chain of custody is carefully monitored.

In addition to analysing samples in the laboratory, staff from FSI provide professional advice and training on the appropriate samples to be taken from crime scenes and individuals and in some circumstances they attend crime scenes. We also operate an out of hours service for situations where investigating Gardaí need access to immediate information or when it is necessary to visit crime scenes.

We work closely with AGS on cases where our findings have the potential to make a difference. We provide value for money for the State by ensuring that our expertise and resources are used in instances where they are more likely to include or exclude suspects rather than provide findings that are neutral.

Staff act as expert witnesses in criminal trials. There is the potential for this to occur in all cases but court attendance is required from approximately 1% of cases across the laboratory. Some areas of work are more likely to result in court cases than others. Attendance at court can involve robust defence of scientific findings but usually the witness is required to outline routine processes related to continuity or laboratory procedures.

## The following sections outline progress against the goals defined in the Strategy Statement 2015-2018.

A scientist wearing a white lab coat, a white hairnet, safety glasses, and a white face mask is working in a laboratory. They are wearing blue gloves and are focused on a task on a table covered with a white cloth. A red biohazard vest is worn over the lab coat. In the background, a microscope and other laboratory equipment are visible. A white box with a black border is overlaid on the image, containing the text "Excellence in Science".

**Excellence in Science**

# Excellence in science

## Goal 1

### Provide a **quality** forensic science service.

- FSI used ISO 17025 throughout the year to manage continuous improvement. Four management review meetings were held with senior staff to manage this system in 2016. These meetings recorded the various sources of feedback and follow up activity. The annual assessment by INAB took place 28th Oct and 2nd Nov with a successful outcome. Of particular note was a focus on backlogs and its correlation to staff shortages. A new document and compliance management software 'Paradigm 3', was introduced to provide a user friendly integrated system to manage both our documents and other aspects of our quality management system such as training, corrective action, recording complaints and calibration records .

### Case study 1

*In November 2014 a young 15 year old girl went out socialising with friends. She went missing for a period of time during the night and it is believed that she may have been sexually assaulted.*

*Following examination of the sexual offences kit a report was issued from Forensic Science Ireland. This indicated that a DNA profile was obtained from the semen found on the vaginal swabs taken from the victim and that the source of this profile was unknown. This unknown DNA was entered into the DNA database when it commenced in November 2015.*

*Within the first three months of operation of the DNA database a sample was submitted from a suspect who had been detained for a traffic offence which was found to match the profile from the semen.*

# Excellence in science

## Goal 2

### Anticipate future technological opportunities and their applications to casework.

- The technology developments that occurred in FSI in 2016 related to DNA and IT. The DNA story is outlined in the database section. A Laboratory Information Management System (LIMS) had its first full operational year in 2016.
- A range of software packages are in use at FSI. Some significant ones were installed in 2016 including STRMix -the package to deal with the reporting complexities of DNA mixtures. This is vital following the adaption of the 17 plex chemistry.
- A male only DNA chemistry YSTR was introduced into casework in 2016 and reported in a few cases of sexual assault.
- A more sensitive DNA quantification system was also introduced in 2016 to match the sensitivity of the 17 plex chemistry.
- A number of New Psychoactive substances were identified in 2016.
- Two senior staff were allocated specific tasks to keep abreast of technology changes in DNA and Chemical sciences.
- Staff continued to engage with the literature in 2016 and contributed to it.
- One of the mechanisms to ensure that the science in use is up to date is active participation in European Network of Forensic Science Network (ENFSI). Staff attend annual meeting of the technical working groups of DNA, Drugs, Fires, Paint and Glass, Marks, Explosives and Firearm Residue. FSI is also active in the quality liaison group, the R&D standing committee and the Director General attends the overarching ENFSI meeting. This network facilitates the provision of proficiency trials, as well as updates in best practice.
- ENFSI is also working on projects in relation to formation of Forensic Science Area 2020 as promoted by the EU. This includes a number of EU funded Monopoly projects to formulate databases among other things. One of the Monopoly projects is carrying out research on background DNA.
- In November 2016 FSI hosted an ENFSI Monopoly Project meeting. This meeting (EuSISS+ "Towards the Development of of Pan European Databases in Forensic Science) was part of a project on the formation of a database for security inks.
- FSI has also been active in the Association of Forensic Science Providers. The Director General attends the strategic meetings and relevant staff the various working groups. The quality group collaborates to produce proficiency trials and collaborative exercises that are not available commercially and the Body Fluid Forum collaborates to carry out background research to assist interpretation.



Please see page 34 for information on publications and presentations.

## Excellence in science

### Goal 3

**Increase support for learning opportunities.**

- Online journals are available at FSI.
- Some staff have attended on-line webinars.
- Publications from FSI is evidence of ongoing interaction with the forensic science scientific community.

## Excellence in science

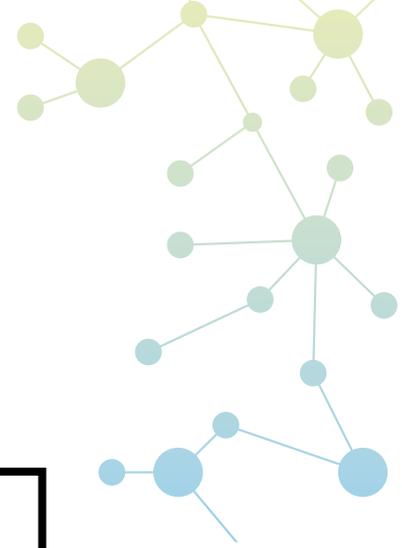
### Goal 4

**Ensure that we are operating to best international practice.**

- A benchmarking project supported by ENFSI to compare management metrics was delayed again in 2016 but is due to go ahead in 2017.



**Customer Service**



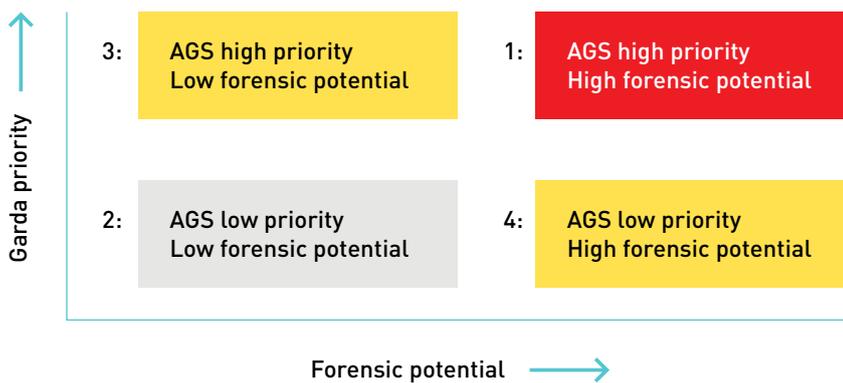
# Customer Service

## Goal 1

**Deliver excellent Customer Service to our clients**

- The service of FSI is based on a service level agreement signed by the Commissioner of AGS and the Director General of FSI. The document highlights that a partnership approach is needed to ensure that the resources of FSI are used to best effect. The document is quite wordy because a forensic science service is quite complex and varied and demand frequently outweighs resource to deliver. A case prioritisation system is in operation as outlined in Figure 1 below. The cases of high public interest and where the contribution of science is clear, get highest priority and those of low public interest where the contribution of science is neutral, get little or no attention.

Figure 1. Factors for consideration in case prioritisation.



Examples of the types of Chemistry cases examined in 2016 are illustrated in Figure 2 below. This shows the range of specialities and case types examined by the Chemistry section.

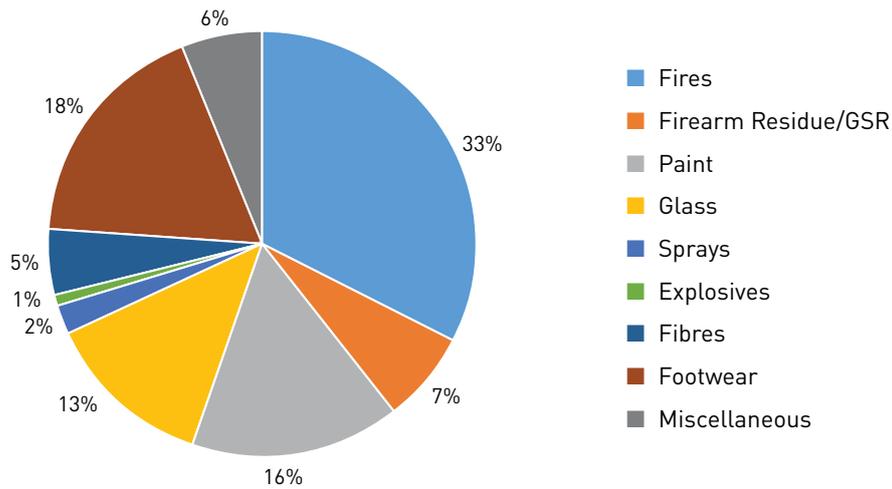


Figure 2. Different types of Analysis (with proportions) carried out by Chemistry Section.

The trends in Drug submissions from 2004 to 2016 are shown in Figure 3 below.

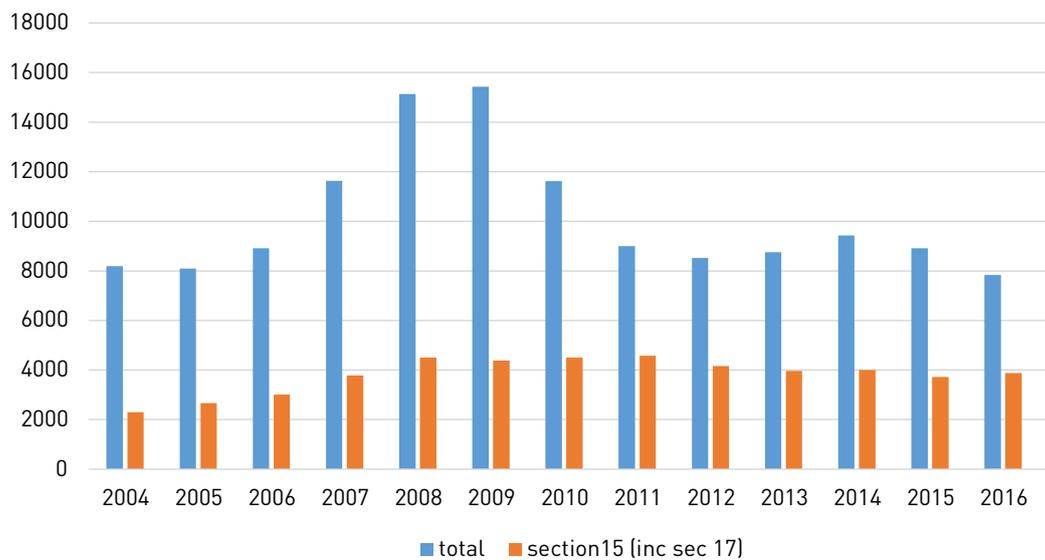
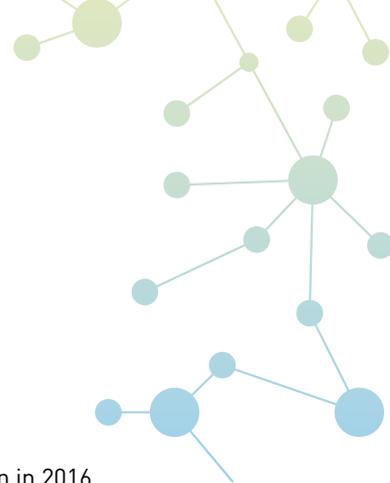


Figure 3. Trends in Drug submissions to FSI from 2004 - 2016.



Figures 4 and 5 show the types of drug cases analysed by the Drug section in 2016.

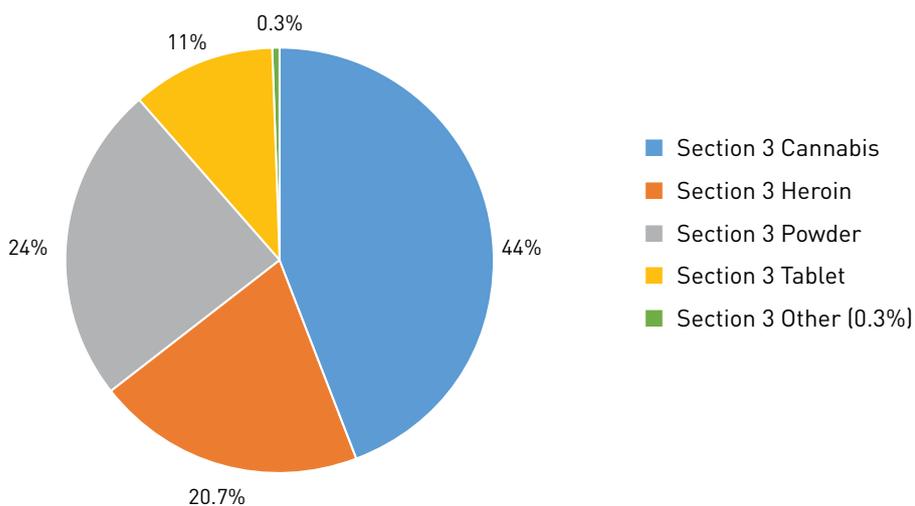


Figure 4. Different types of Section 3 Analysis carried out by Drugs Section. Section 3 offences involve possession of illegal drugs for personal use.

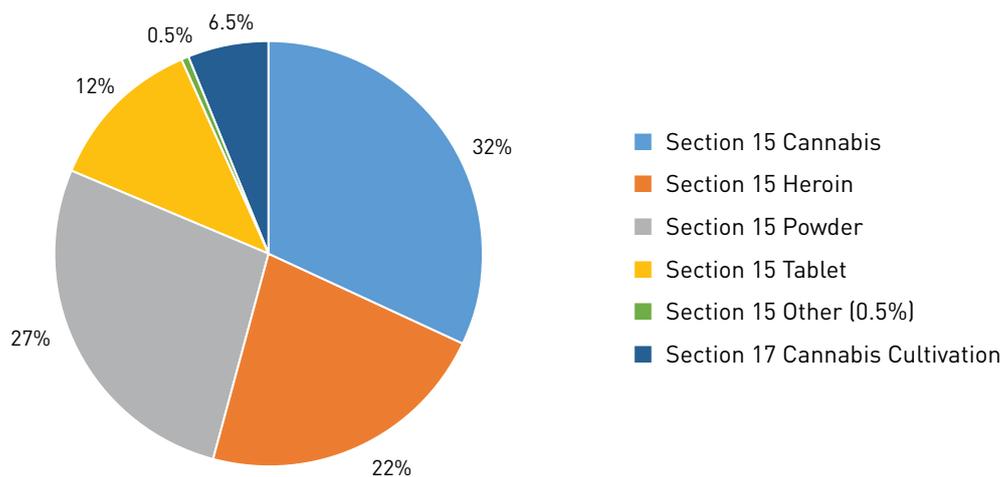


Figure 5. Different types of Section 15 Analysis carried out by Drugs Section (Section 17 also are shown). Section 15 offences involve possession of illegal drugs for sale or supply. Section 17 offences involve cultivation or growth of illegal drugs.

The DNA section is further divided into teams to deal with the wide range of cases where DNA analysis is useful (see figure 6).

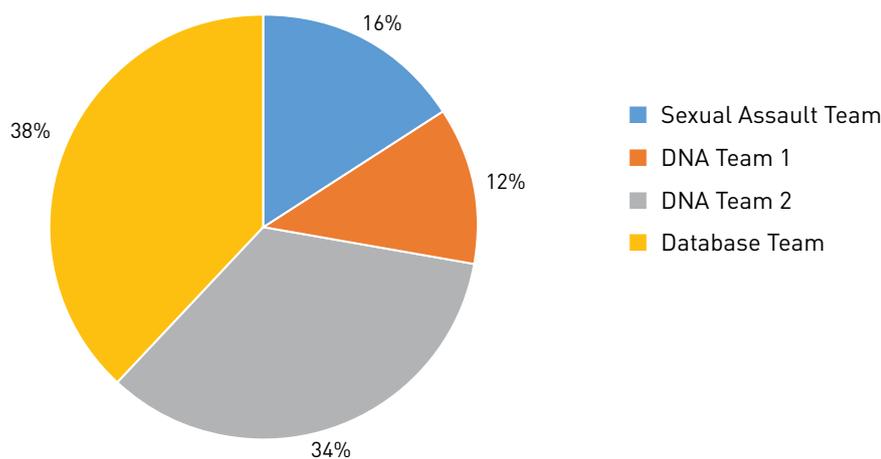


Figure 6. Different types of cases reported by the DNA section in 2016 (and proportions).

- Because of backlogged cases due to staff shortages, FSI did not reach its overarching goal of having a system in place to communicate the expected delivery times to AGS for the vast majority of cases while continuing the practice of assisting in real time on high profile investigations.

## Case study 2

*Kenneth O'Brien left his home on the 15th of January 2016. The following day a torso in a suitcase was discovered by walkers at the Grand Canal near Celbridge, County Kildare. Following Garda searches a number of other bags were found which contained body parts. Forensic Science Ireland carried out the DNA testing on the body parts and confirmed the identity of the remains as Kenneth O'Brien. FSI also carried out a number of examinations and DNA testing on other items and exhibits in this case. A suspect has been charged with murder in this case – the trial is scheduled to be held later this year.*



### CASE NUMBERS

- FSI issued reports in 3,196 non Drug cases (612 Chemistry, 2584 DNA) and 6,041 Drug cases in 2016. As 14,008 cases in total were received there were significant backlogs at the end of the year. Neither figure takes into account the 9,048 reference samples added to the DNA database.
- The cases in 2016 included a number of high profile cases which took considerable resources because of their size and complexity.
- DNA was also used extensively in major Drug seizures and investigations related to the gangland murders in the second half of the year. Gardaí were particularly complimentary of the service in this area acknowledging that the volume of work and fast reactive service required in these cases impacts on routine casework.



### COURT CASES

- A percentage of the cases examined result in court cases each year. Frequently these court cases relate to reports issued in earlier years. On 82 occasions staff from FSI attended court in 2016. The types of cases involved are varied as casework itself and range from armed robbery, burglary, explosives and firearms as well as murders, sexual assaults and Drugs.

A number of the court appearances were related to giving evidence of finding the victim's blood on the accused:

- In one case of fatal stabbing, blood matching the deceased was found on clothes from the accused's house while in another case blood was recovered from an accused's clothing following a fatal stabbing during a row over TV in prison.
- Blood matching a victim whose skull was fractured from blows of an iron bar was detected on runners from a bin in the garden of the accused's house. Blood patterns, as well as matching DNA were relevant in another case where staining on shoes was more in keeping with kicking actions than passing nearby and not being involved in the assault.
- The suggestion that the accused man's wife fell down the stairs was partially refuted by the evidence that head hairs in the bathroom bin were more in line with the suggestion that she was pulled out of bed by the hair and thrown down the stairs.

It is unusual for scientists to be called as witnesses when their findings do not support the prosecution case as this often means the case is not pursued.





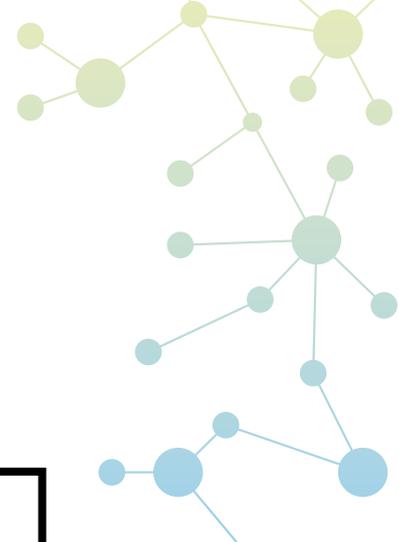
#### DEFENCE VISITS

- Various scientists employed by the Defence Team visited FSI on 34 occasions in 2016. The majority of these visits related to re-examination of Drug seizures, even though the number of times scientists from FSI are required to attend court in such cases is low. DNA was the second most common evidence type examined. On two of the ten occasions that DNA was the issue, FSI re-profiled the samples at the request of the defence. Explosives, firearm residue, matching footprints, matching fibres and matching rubber were also re-examined. No issues arose in subsequent court cases arising from these examinations.

### Case study 3

*On the 2nd of November 2016, two forensic scientists (DNA and Chemistry) from FSI gave evidence at the murder trial of Liam Power, who was accused of assaulting and killing Gints Intembergs in County Carlow in September 2014. FSI identified blood stains matching the deceased on Liam Power's runners. Blood pattern analysis stated that the stains on the runners could be created by kicking, and footwear analysis of marks on the body matched the pattern of Liam Power's runners. He was subsequently convicted of the murder of Gints Intembergs.*





## Customer Service Goal 2

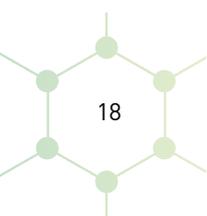
### Promote the practice of **presumptive testing** of Section 3 Cannabis and Cocaine cases by An Garda Síochána.

Presumptive testing was promoted at any appropriate meeting with AGS. In 2016, 37 Gardaí were trained in the use of presumptive testing. The kits used for presumptive testing were previously validated by FSI.

Figure 3 shows the variation in the number of Section 3 (for personal use) cases submitted from 2004 - 2016. The variation over the years reflect changes in section 3 submissions. The Section 15/17 (supply or cultivation) cases increased from 2006 - 2009 followed by a decrease which shows a slight increase again in 2016. A drop of 8% in the number of Section 3 cases is noted between 2015 and 2016 while the number of Section 15/17 increased slightly in 2016. There is much less variation in the number of serious (Section 15 or Section 17 cases) cases submitted to FSI over the time period as Figure 3 shows.

### Case study 4

*On the 26th of October 2016, Forensic Science Ireland released a report on the purity of drug seizures in Ireland. This report showed that bulk (large) cocaine seizures in Ireland typically had a purity of 40%. This is consistent with other European countries. Other compounds present in cocaine included levamisole (a drug used by vets to treat parasitic worms), benzocaine and lignocaine (local anaesthetics used by dentists) and phenacetin (a painkiller banned in a number of countries). Bulk heroin was approximately 33% pure – typically heroin also contained different combinations of phenacetin, paracetamol and caffeine amongst other substances. The main drugs encountered in FSI in 2016 were cannabis, cocaine, heroin, benzodiazepines and MDMA (ecstasy).*



## Customer Service

### Goal 3

**Provide “at scene” attendance and out of hours service for major or urgent cases.**

The system to facilitate an out of hours service continued in 2016. Each scientist mans a phone for a week at a time and a smaller group of 20 persons are available to attend scenes or to carry out necessary urgent laboratory work. In 2016 there were seven instances when Drug analysis was needed, 16 instances when other work primarily DNA was needed or scene attendance and 16 occasions when specialist information was sufficient to address the query.

Fourteen scenes were visited. These were mainly related to deaths and one to a clandestine drug laboratory. Often scene visits occur out of hours. In line with the strategy of continuous development of staff when possible less experienced staff accompanied experienced scene goers.

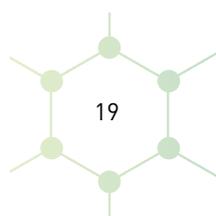


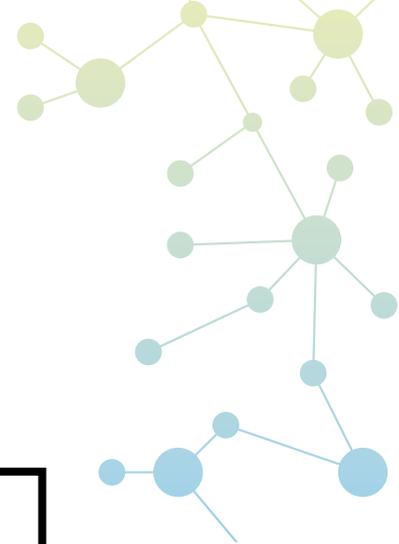
## Customer Service

### Goal 4

**Contribute to Cold Case reviews so that maximum benefit is obtained from modern scientific techniques.**

The service in cold cases has been ad hoc over the years. Plans were made towards the end of 2016 to have a nominated person to interact with all cold case queries. This system is working well and new information was supplied in one case in 2016 which was helpful but not critical for the investigation.





## Customer Service Goal 5a

**Ensure that evidence in Court is given in a consistent **well-informed** manner.**

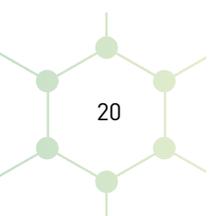
Mentoring was given to new staff who were also given some external witness training. Plans are in hand to provide more expert witness training.

## Customer Service Goal 5b

**Continue to provide high quality credible **expert opinion** in reports and in court.**

The process of peer reviewing all reports issued by FSI continued in 2016 with a particular emphasis on checking that the evidence presented would not be open to misinterpretation by the end users (i.e. the Gardaí and the courts). The customer surveys, traditionally used to check for understanding of FSI reports by the Gardaí, have dropped off since moving to electronic reporting and a new system for getting customer feedback is being sought.

When appropriate, evaluative opinion is used in reports. Most reports involving trace evidence are reported evaluatively. Evaluative reporting assesses the relative strength of the evidence given a defence scenario and a prosecution scenario. Some cases involving DNA also lend themselves to be reported evaluatively and where this is not possible and the evidence may be misleading, a caveat is added to DNA reports to highlight that the rarity of the profile is not synonymous with the relevance or significance in the context of the case.



## Customer Service Goal 5c

**Improve productivity through increased use of summary reports.**

Summary reports were not pursued but the use of template reports was maximised as soon as LIMS came into use, thereby increasing efficiency.

## Customer Service Goal 5d

**The provision of joint cross sectional reports in appropriate cases.**

This goal was not progressed across disciplines but as much as possible, DNA Database matches that arise in case work are being reported with the rest of the case.



## Case study 5

*On the 19th of January 2016, Gardaí were called to a house in Cork to an extremely distressing scene. A number of young people had consumed drugs and were heavily intoxicated, partially clothed and dancing on broken glass. One male had collapsed on the ground – this male passed away in Cork University Hospital a number of days later. Initial media reports indicated that the partygoers had consumed a designer drug called 2CB. FSI identified the drug as 25I-NBOMe (N-Bomb), a highly toxic hallucinogenic drug.*

*This drug had rarely been seen in Ireland (6 times since 2010) and was most commonly presented as blotter paper soaked in the drug. It was consumed as a white powder on this occasion. As the partygoers thought they were taking a different drug, the amount of white powder consumed turned out to be highly toxic (they ended up taking a hundred times the normal dose).*

*The analytical challenges encountered in this case illustrate some of the issues FSI must address. Because the drugs are newly synthesised, there is no reference material available to assist in identification.*

A close-up photograph of a microscope's objective lenses and eyepiece, with a bright light source illuminating a specimen slide. A white rectangular box with a black border is centered in the middle of the image, containing the text "Modern Organisation".

**Modern Organisation**

## Modern Organisation

### Goal 1

To **improve** our Information and Communication Technology (ICT) system and facilities.

- A laboratory management information system (LIMS) had been at the design stage for a number of years and celebrated its first year of operation in October 2016. This system is vital to handle high throughput and in spite of careful planning, the implementation phase consisted of a steep learning curve.
- At the same time as the implementation of LIMS, it was agreed with AGS that reports would be e-mailed rather than posted as hard copy. Virtually all reports are now e-mailed to District mail boxes.
- Windows was upgraded to Windows 7 across the laboratory.
- Investigations began to migrate the servers at FSI to a managed shared system within Department of Justice and Equality.
- As part of the new branding of FSI, the web site was redesigned.

#### Case study 6

*On the 25th of October 2016, two forensic scientists (DNA and Chemistry) from FSI gave evidence at the murder trial of James Lammon, who was accused of shooting Jason Doogue in August 2015. FSI identified firearm residue on a pair of latex gloves and also found DNA matching James Lammon on the gloves. These gloves had been recovered in fields by Gardai who were searching around Mr Lammon's house. He was subsequently convicted of the murder of Jason Doogue.*

#### Case study 7

*A number of linked gangland shootings have occurred around Dublin since the Regency Hotel shooting on the 5th of February 2016. FSI have diverted significant resources to help AGS a by issuing urgent analysis results on a wide range of exhibits. These exhibits include obtaining DNA profiles from weapons, clothing and items relating to gangland activities, analysing large seizures of drugs, and analysing clothing and items for firearm residue. The volume of work and fast reactive service of FSI is ongoing as AGS continue their intensive investigations into this series of crimes.*

# Modern Organisation

## Goal 2

### **Purpose built facilities suitable for a 21st century forensic science institute**

- In acknowledgement of the urgent requirement for a purpose built facility, the Department of Justice and Equality put plans in place in 2016 to bring the commencement date forward to 2017. This requirement arises in particular out of the need to have the space and physical requirements (e.g. air pressure rooms) to extend the interim database facilities commenced on the 20th November 2015 and for Ireland to honour its commitment under the Prum treaty to share DNA data with the other twenty six nations.
- The Tánaiste and Minister for Justice and Equality acknowledged the urgent need for the new building and allocated €6 million in the 2017 budget to enable the commencement of the project to be changed from 2019 to 2017.



## Modern Organisation

### Goal 3

**Facilitate a culture that supports the achievement of best HR practice and professional development.**

- Funding was allocated for additional staff in 2015. Space for these staff and additional space restrictions caused by modifications to the building to comply with fire regulations meant that some temporary measure was needed before the capital building was available. Department of Justice and Equality arranged to have plans drawn up for additional temporary facilities. Case reception was moved from the foyer to a portacabin in the courtyard and a two story portacabin will provide office accommodation in 2017.
- A pilot Continuous Professional Development (CPD) scheme was launched.
- A weekly newsletter is circulated.
- Discipline meetings encourage discussion on all scientific matters and issues related to improvement.
- A renewed Health and Safety campaign was commenced.
- The supportive culture initiative and health and safety initiative were submitted to the Irish Institute for Training and Development (IITD) where FSI won the Excellence through People award.
- Discussions in relation to workforce planning were held with HR in the Department of Justice and Equality.
- Competitions were held for promotional posts and additional staff.



# Modern Organisation

## Goal 4

### Enhance our relationships with all key stakeholders.

#### Department of Justice and Equality

A performance agreement between FSI and the Department of Justice and Equality was signed during the year. Throughout 2016, there were many meetings with the parent department dealing with specific issues relating to FSI and to the change initiative in the Department of Justice and Equality. Thus there were multiple meetings in relation to the DNA database, the need to be Prum compliant, performance agreements and ICT and infrastructural needs with particular emphasis on the urgent need for a new purpose built facility. In addition FSI participated in Criminal Justice Sector meetings, horizon meetings and interoperability programs.

#### An Garda Síochána

Most of the meetings with AGS are operational in nature and consist of various interactions at all levels of the organisation with issues that arise in case work particularly in complex cases. Many meetings took place in 2016 between FSI and NFCO (National Forensic Coordination Office) which acts as the link between FSI and AGS in relation to all matters relating to the national DNA database.

FSI also provided speakers for training courses and for the Garda Commissioners conference and attended the Garda Regional senior managers' conferences.

#### Staff

The tradition of holding a business planning day did not take place in 2016. The strategy statement 2015-2018 had been launched on the same day as FSI celebrated forty years in operation marked with a visit to the Aras on the 12th November 2015. The business plan for 2016 was based on the strategy with particular emphasis on commencing the DNA database and highlighting the need to change the date of the commencement of the new facility at Backweston.

An outside facilitator worked with the Drugs discipline to promote improved team work.

Issues related to staff occur elsewhere in the report.

#### Sexual Assault Treatment Units

Sexual Assault Treatment Units (SATUs) provide specialist care for people who have been recently sexually assaulted or raped. There are six units throughout the country and as part of their remit they are responsible for obtaining forensic evidence, which may be deposited. FSI supports SATUs by providing evidence recovery kits and guidelines on their use, advising on anti-contamination protocols, monitoring background DNA levels and providing FSI scientists for SATU staff training courses. FSI are members of the SATU Liaison group and the National Guidelines group. Noeline Blackwell, CEO of the Dublin Rape Crisis Centre, also visited FSI in 2016.

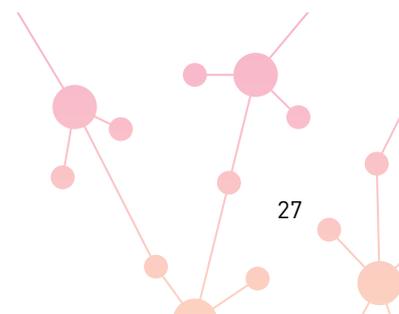
#### Public

- FSI staff participated in various media outlets.
- A twitter account was activated.
- A corporate image of FSI was designed and promoted at all possible opportunities.
- Staff delivered lectures for Science week.
- Staff spoke at Missing Persons Day at Farnleigh on the 7th December and facilitated relatives giving DNA samples.

#### Visitors

Visitors to FSI in 2016 included some experts from Netherlands and Estonia who, while complimentary of the service delivered to stakeholders, expressed concern at the lack of purpose built facilities to match developments in technology.

A group of geologists gave a seminar during a visit and organisers of the ENFSI Archaeology held the preplanning meetings at FSI.



## Case study 8

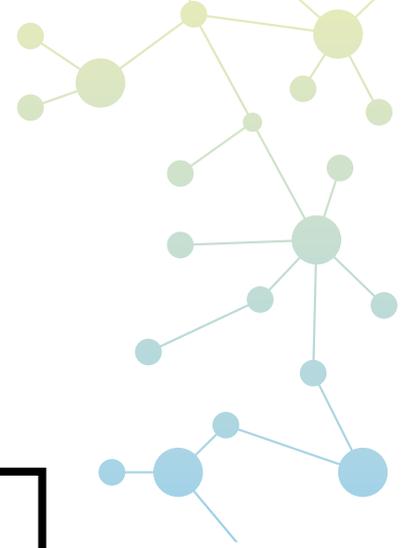
*On the 29th of July 2016, a man entered the home of an eighty year old, armed with a weapon and looking for money. In the course of the burglary, a piece of blue latex glove was left at the scene, which was subsequently submitted to Forensic Science Ireland for DNA profiling. There was no nominated suspect(s) for the burglary.*

*A male DNA profile was obtained from the glove which was uploaded onto the DNA database for comparison with the samples taken from suspects detained by the Gardaí in connection with serious offences.*

*A match was found to an individual who had been detained two months earlier for public order offences.*

A close-up photograph of a scientist in a laboratory setting. The scientist is wearing a white lab coat, a white surgical mask, and a white surgical cap. They are wearing blue nitrile gloves. The scientist is using a blue pipette to transfer a small amount of clear liquid into a clear glass test tube. The background is slightly blurred, showing other laboratory equipment and a clean, professional environment. The lighting is bright and even.

## **DNA Database**



# DNA Database

## Goal 1

**Further develop and enhance our service delivery by the operation of the DNA database.**

The DNA database commenced operation on the 20th November 2015 and its implementation is one of the most important crime fighting tools introduced within the State in recent times. Using the database, information is supplied to the Gardaí about links between people and unsolved crimes. These crimes have ranged from burglary/criminal damage to crimes against the person, sexual assault/suspicious deaths. The power of the database as an investigative tool is that it is providing Gardaí with investigative leads in previously unsolved serious crimes. The database can replace more traditional and time consuming police investigative methods and provide more focus to a criminal investigation. Also it is now possible to retain samples from relatives of missing persons to aid in the investigation of unknown remains.

Figure 7 shows the number of profiles from persons uploaded to the database in each month from the date of commencement. In total 9,048 were added by the end of December 2016.

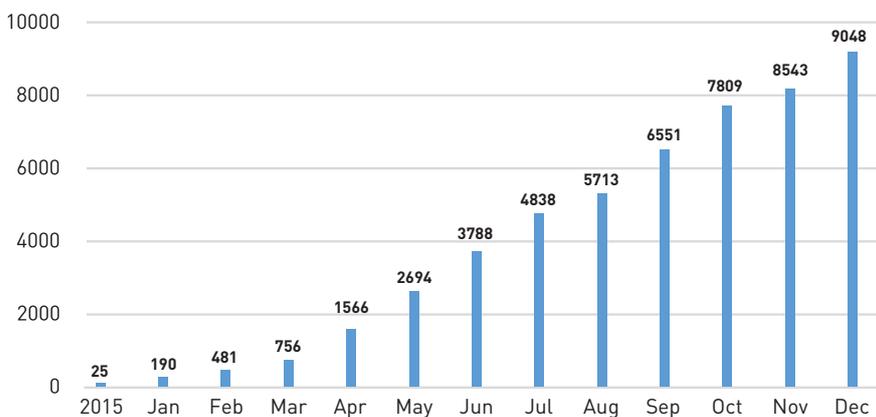
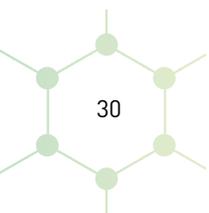


Figure 7. Number of profiles uploaded to the database each month to the end of 2016.



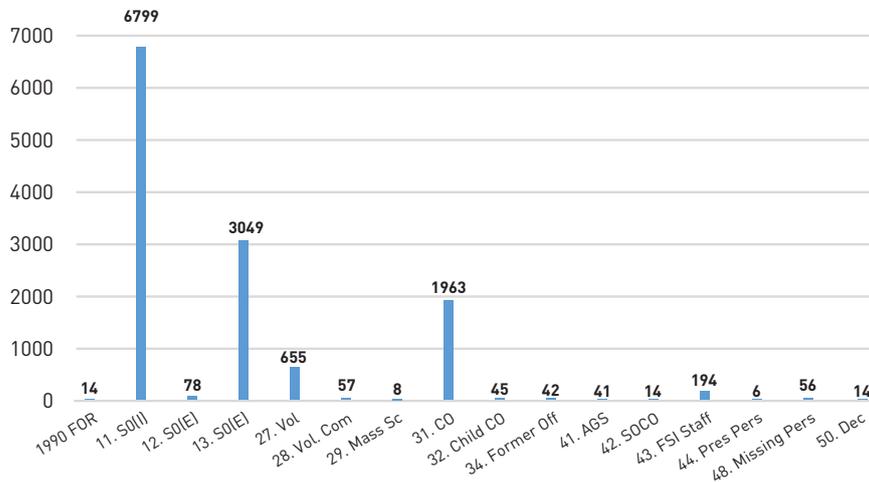


Figure 8. Shows the various section of the Act under which the samples were taken.

**Investigative links**

Two potential matches can occur when an additional profile is added to the database – a crime stain can match another crime stain suggesting a link between crimes or the crime stain can match to a person suggesting a link between the person and the crime. The DNA Database identified 428 hits in 2016 which assisted 625 cases. The types of hits are detailed below.

- (a) Crime scene samples linked to other crime scene samples.

This type of match occurred 43 times in 2016. In 32 such cases, a case to case match was reported while in the other 11 cases, there were clusters of cases associated with each other. Overall this resulted in 105 investigative links ('hits') between unsolved crime stains - see Figure 9 below.

| Case Type                         | Number     |
|-----------------------------------|------------|
| Burglary                          | 55         |
| Criminal damage                   | 6          |
| Unlawful taking of vehicle        | 15         |
| Robbery/ theft                    | 10         |
| Road Traffic Accident/Hit and Run | 2          |
| Murder/fatal shootings            | 4          |
| Assault                           | 2          |
| Explosive/Firearm                 | 2          |
| Armed Robbery                     | 1          |
| Other                             | 8          |
| <b>Total</b>                      | <b>105</b> |

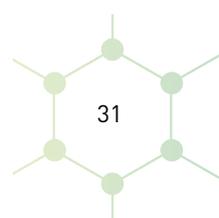
Figure 9. Unsolved stain to stain matches in 2016 (105 investigations).

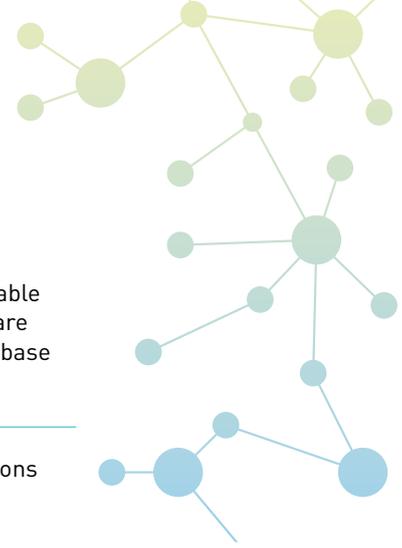
**Persons linked to crime stains**

There were 385 person to stain matches in 2016. 308 of these were person to single case matches providing assistance to 308 investigations while in 77 cases the person was linked to multiple case matches providing assistance to 212 investigations. In total 520 cases have been aided by the operation of the DNA database in 2016. The details of the cases involving person to stain matches is available on Figure 10. 84% or 321 of the profiles that matched stains originated from samples taken from suspects while 16.6% or 64 profiles originated from convicted offenders.

| Case Type                  | Number     |
|----------------------------|------------|
| Burglary                   | 295        |
| Criminal damage            | 57         |
| Unlawful taking of vehicle | 37         |
| Robbery/ theft             | 42         |
| Sexual assault             | 5          |
| Murder                     | 2          |
| Assault                    | 8          |
| Drugs                      | 20         |
| Other                      | 54         |
| <b>Total</b>               | <b>520</b> |

Figure 10. Person to Stain Matches. Types of Investigations and the number of each involved in 2016.





- Metrics used internationally to assess the effectiveness of databases are available on figs 11 and 12. These figures were as of the end of February 2017 and they are well within the norms of functioning databases and are indicative that the database is performing well.

H/N: The Number of Person-to Stain- Matches Relative to the Number of Persons included in the Database

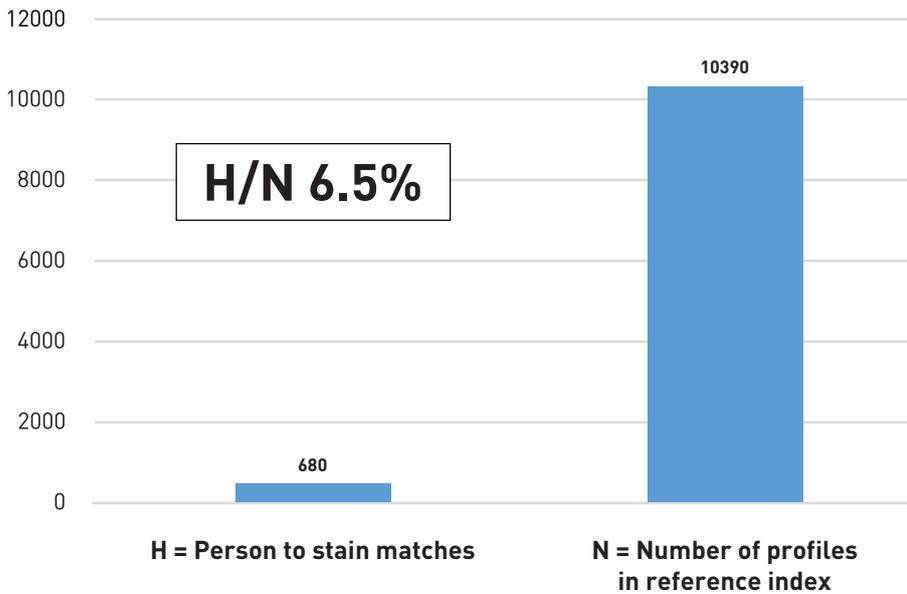


Figure 11. This figure indicates the appropriateness of the sampling policy (i.e. sampling suspected offenders and convicted offenders).

H/N: The Number of Person-to Stain- Matches Relative to the Number of Stains included in the Database.

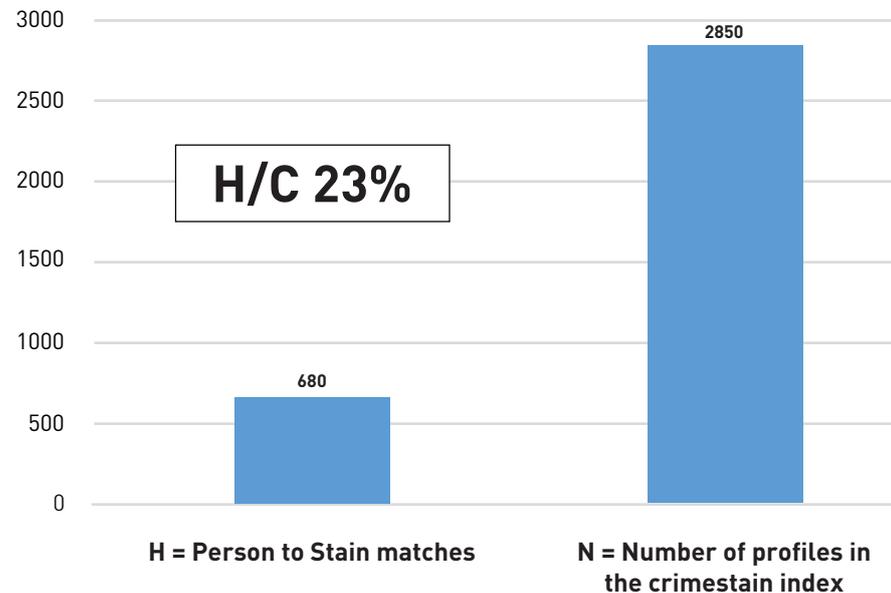
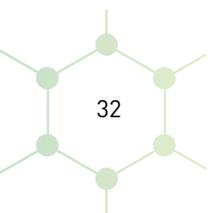


Figure 12. This measures the crime solving capacity and is expected to grow as the database grows (i.e. 23 out of every 100 crime scene samples uploaded onto the database will be linked to a person).



## DNA Database

### Goal 2

**Implementation and maintenance of best practice for quality and security.**

- The DNA database oversight committee visited FSI four times in 2016.
- The report of their activities is available and has been published in tandem with this annual report.

## DNA Database

### Goal 3

**Support An Garda Síochána, the Department of Justice and Equality, the National DNA database oversight committee and the Oireachtas by providing information and data on matters relating to the DNA database.**

- All output from the database is reported to AGS, both to the investigating Garda and the coordination office (NFCO).
- There is daily contact between staff of the DNA database and staff of the Garda National Forensic Coordination Office as well as meetings based on the protocol between FSI and AGS.
- Information is supplied to Department of Justice and Equality as requested.
- A quarterly report on statistics from the database was supplied to the Oversight committee.
- A report on the establishment and operation of the database was submitted for the Civil Service Taoiseach's awards and shortlisted.
- This annual report is supplied to the Oireachtas.

## Publications and Presentations

### The following papers were published by FSI staff in 2016

- Forensic analysis of P2P derived amphetamine synthesis impurities: identification and characterization of indene by-products.

J.D. Power, P. Kavanagh, G. McLaughlin, G. Dowling, M. Barry, J. O'Brien, B. Talbot, B. Twamley, S.D. Brandt.

*Drug Test. Analysis.* **2016** doi: 10.1002/dta.1944.

- The synthesis and characterization of the 'research chemical' N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-(cyclohexylmethyl)-3-(4-fluorophenyl)-1H-pyrazole-5-carboxamide (3,5-AB-CHMFUPPYCA) and differentiation from its 5,3-regioisomer.

McLaughlin, G., Morris, N., Kavanagh, P.V., Dowling, G., Power, J. D., Twamley, B., O'Brien, J., Talbot, Dowling, G. and Brandt, S. D.

*Drug Testing and Analysis*, 2016, 8, 9, 920-9.

- Test purchase, synthesis, and characterization of 2-methoxydiphenidine (MXP) and differentiation from its meta- and para-substituted isomers.

McLaughlin, G., Morris, N., Kavanagh, P.V., Dowling, G., Power, J. D., Twamley, B., O'Brien, J., Talbot, Elliott, S. P., Wallach, J., Hoang, K., Morris, H. and Brandt, S. D.

*Drug Testing and Analysis*, 2016, 8, 1, 98-109.

- Synthesis, characterization and monoamine transporter activity of the new psychoactive substance mexedrone and its N-methoxy positional isomer, N-methoxymephedrone.

McLaughlin, G., Morris, N., Kavanagh, P.V., Dowling, G., Power, J. D., Twamley, B., O'Brien, J., Talbot, B., Walther, D., Partilla, J.S., Baumann, M.H. and Brandt, S. D.

*Drug Testing and Analysis*, 2016 e pub

- Test purchase, synthesis and characterization of 3-fluorophenmetrazine (3-FPM) and differentiation from its ortho- and para-substituted isomers.

McLaughlin, G., Morris, N., Kavanagh, P.V., Dowling, G., Power, J. D., Twamley, B., O'Brien, J., Talbot, B., Sitte, H. and Brandt, S. D.

*Drug Testing and Analysis*, 2016 e pub.

- ENFSI Guideline for Evaluative Reporting in Forensic Science; Christophe Champod, Alex Biedermann, Joelle Vuille, Sheila Willis and Jan De Kinder; Criminal Law and Justice Weekly vol 180 March 12 2016;

- Forensic Sci Int Genet. 2016 Mar;21:117-8. doi: 10.1016/j.fsigen.2015.12.013. Epub 2015 Dec 24.

A response to Meakin and Jamieson DNA transfer: Review and implications for casework.

Casey DG1, Clayton N2, Jones S3, Lewis J4, Boyce M5, Fraser I6, Kennedy F7, Alexander K8.

- J Forensic Sci. 2016 Dec 23. doi: 10.1111/1556-4029.13325. [Epub ahead of print] The Persistence of Sperm and the Development of Time Since Intercourse (TSI) Guidelines in Sexual Assault Cases at Forensic Science Ireland, Dublin, Ireland.

Casey DG1, Domijan K2, MacNeill S1, Rizet D1, O'Connell D1, Ryan J1.

- Report on 4th International conference on Novel Psychoactive Substances, Budapest 30-31 May 2016 by Michelle Boyle ; Drugnet Ireland, Issue 59 2016.

### Presentations

Staff from FSI deliver many presentations as part of their ongoing work – training courses to Gardaí, outreach lectures to students and other public groups and presentations to various visitors. Below are the more scientific presentations on particular topics.

- Joint meeting with the Law Society in conjunction with Duncan Woods KBC- Work of FSI ; Dorothy Ramsbottom.

American Academy of Forensic Sciences.

- Workshop Strategies for Scientific Problem Solving with Physical Evidence "Rewarding "A" while hoping for "B""; Sheila Willis.

ENFSI Drugs Working Group Annual Meeting in Slovenia

- "Update on new ENFSI Sampling Guidelines for Qualitative Analysis & updated software"; Hugh Coyle.
- An update on some novel by-products formed during the synthesis of amphetamine via the APAAN tro P2P Leuckart route; John Power.

Chartered Society of Forensic Sciences Birmingham

- "DNA transfer in the absence of contact"; David Casey.
- "New Psychoactive Substances - The Irish Experience"; Hugh Coyle.
- "Evaluation of vehicle driver identification in casework"; Sarah Fleming.
- Stuart Kind Memorial lecture; Sheila Willis.

ENFSI Fire working group

- Analysis of fire debris at FSI; Barbara Buchanan

Workshop on DNA Activity in Casework

- "Evaluation of vehicle driver identification in casework"; Sarah Fleming.
- "Evaluative Approach in a sexual assault case involving saliva"; John Hoade.
- "DNA activity level workshop: Sexual Assault"; Charlotte Murphy.

Missing Persons day 7/12/16, Farmleigh; Dorothy Ramsbottom

## Case study 9

FSI experienced a number of "new" drugs this year. Each new compound detected presents a new analytical challenge as often there are not "reference standards" available that the unknown/new drug can be compared to. Users of these new drugs take great risks as the toxicity of them can be 100 –fold higher than other similar drugs.

New drugs encountered in 2016 included:

**Benzodiazepine drugs:** Phenazepam, Nitrazolam, Etizolam, Chlorodiazepam

**Cathinone (stimulant) drugs:** Pentylone, Dipentylone, Dibutylone, Ethylhexedrone, N-ethylpentedrone,  $\alpha$ -PVP, Clephedrone, MPHP, PV8 ( $\alpha$ -PHP), PV9 ( $\alpha$ -POP), Chloro-PVP, 4-chloro- $\alpha$ -PPP

**Synthetic Cannabinoids:** 5F-MDMB-PINACA, 5F-AKB-48, 5F-PB-22

**Tryptamines (stimulant) drugs:** Methyltryptamine, Dimethyltryptamine, 5-MEO MIPT

**NBOMe's:** 25I-NBOMe

**Fentanyl (Opiate-type) Drugs:** Fentanyl, Pentanoyl fentanyl, 2-Fluorofentanyl

**Other drugs:** 3-Fluorophenmetrazine (Stimulant-type drug)



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 [@ForensicSci\\_Ire](https://twitter.com/ForensicSci_Ire)