Research and Innovation Roadmap
2019 Annual Projects
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>01</td>
</tr>
<tr>
<td>Capability Development</td>
<td>02</td>
</tr>
<tr>
<td>Service Delivery Improvement</td>
<td>03</td>
</tr>
<tr>
<td>Forensic Fundamentals</td>
<td>04</td>
</tr>
<tr>
<td>Operational Requirement</td>
<td>05</td>
</tr>
<tr>
<td>Intelligence Application</td>
<td>06</td>
</tr>
<tr>
<td>Increasing Efficiency</td>
<td>07</td>
</tr>
<tr>
<td>Education and Training</td>
<td>08</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>09</td>
</tr>
</tbody>
</table>
Overview

This document has been developed by the Australia New Zealand Policing Advisory Agency National Institute of Forensic Science (ANZPAA NIFS), with input from the Australia New Zealand forensic science community through the Specialist Advisory Group (SAG) network and the Research and Innovation Advisory Committee (RIAC). The document articulates the priority areas for research and innovation in forensic science for 2019 approved by the Australia New Zealand Forensic Executive Committee (ANZFEC).

The specific research priorities are posed as questions, to allow researchers to explore opportunities to investigate and address the issues involved. These questions are intended to provide a short-term focussed priority list of the forensic responses detailed in the ANZPAA NIFS Research and Innovation Roadmap, which also provides context in the law enforcement environment, aligning each forensic response to broader strategic policing priorities and crime rate data. The questions contained in this document cannot be addressed by one agency or one research project alone; rather, initiatives aligned to these questions should be collaborative and leverage resources from different sectors of the research community.

ANZPAA NIFS have committed to providing assistance where possible and the process for seeking this assistance is detailed in the ANZPAA NIFS Research and Innovation Strategy. In order to reduce duplication of effort, it is recommended that anyone looking to undertake an initiative aligned to one or more of the questions contained in this document notify ANZPAA NIFS. This will help to identify potential opportunities for collaboration and ensure that resources are shared across the different areas prioritised for further investigation.


Any questions related to the content of any of these documents should be directed to secretariat.nifs@anzpaa.org.au.
What data can be generated to inform an expanded scope of roadside drug testing targets, especially in relation to pharmaceuticals and illicit drugs?

Which massively parallel sequencing methods are sufficiently robust for intelligence and/or casework implementation and what would a roadmap for the implementation of massively parallel sequencing in forensic biology look like?

What options are available for using data modelling and analytics of forensic casework data to generate intelligence to support improved case resolution and prevention?

What forensic tools and methodologies could be developed to analyse and interrogate cloud storage systems to support access to cloud storage for forensic investigations, including consideration of any potential legislative implications?

What novel methods could be developed to increase the success of fingerprint detection and enhancement?

What novel methods could be developed to assist with the detection or collection of both biological and non-biological evidence?
What is the probability of primary, secondary and tertiary transfer of DNA under varying circumstances?

What is an effective model for evaluating the transfer, persistence and frequency of trace evidence?

What is required to develop and operationalise a probabilistic model for the reporting of fingerprint results in Australia and New Zealand?

What information derived from empirical studies can be provided to support time since death assessments in forensic medicine?

How could a cross-jurisdictional database for chemical criminalistics based evidence be developed that is suitable to inform the assignment of likelihood ratios?
How can facial recognition software systems be reliably used in forensic investigations for intelligence and/or evidentiary purposes?

What empirical research can be developed to support the fundamental principles underpinning bloodstain pattern analysis?

What information can be derived from empirical studies that include close known non-matches and human performance testing to demonstrate the validity of forensic pattern comparison disciplines?

Are there any differences in expert performance for bloodstain pattern analysis performed at the scene when compared to digital/virtual methods?

Could medical image databases currently held by forensic institutions be used to assist in the development of validation and skill testing for forensic medical practitioners?
Are rapid DNA devices and methods such as direct PCR suitable for at scene analysis and/or streamlined laboratory processing?

What elements of facial morphology and image capture factors are important for reliable forensic facial recognition and comparison?

What are the implications of the expanding internet and crowd-led/citizen science on future crime and what opportunities exist to exploit these in detecting, reducing and preventing?

Could a technique be developed to identify and provide an indication of the quantity of skin cells on large items/areas to enable targeted sampling for DNA analysis?

What are the best tissue simulants for terminal ballistic testing?

How effective is the data contained within established databases and does this support the development of future databases?
How could existing forensic science disciplines utilise their current processes or information generated from their examinations for forensic intelligence applications?

What forensic disciplines are suitable for the development of cross-jurisdictional databases to inform forensic intelligence applications, and how could these databases be developed?

Could knowledge of drug manufacture, drug production trends and illicit drug markets predict the development of new psychoactive substances?

What are the benefits and risks associated with the use of fingerprints for forensic intelligence purposes, and what caveats are required when reporting these results?

How can waste water analysis data be used to inform multi-agency responses to illicit drug activity and forensic preparedness to drug analysis?
Could the development of a cross-jurisdictional database improve drug identification using portable instruments and what are the benefits and limitations of field deployable drug analysis methods?

What forensic data are suitable for an artificial intelligence analysis workflow and what efficiencies can be gained?

Could more effective algorithms be developed to assess/compare the degree of matching striae in known matches versus known non-matches on bullets and cartridge cases?

What are the benefits and limitations of supplementing oral testimony with visual, interactive and potentially immersive evidence presentation in context?
What is the best mechanism to develop knowledge in relation to advanced evaluative reporting and the development of Bayesian networks?

Could an education and training resource be developed for police to increase forensic awareness, especially in relation to forensic intelligence?

How should performance testing be designed to validate methods, demonstrate competency, and inform training regimes?

How can crime scene contamination minimisation education and training programs address improved sensitivity in trace detection technologies?

What developments in academic and workplace training and professional development programs are required to address the future forensic science operating environment?
Given the existing research in relation to lay person understanding of the results of forensic analyses, what is the optimal method of communication for forensic expert opinions across disciplines?

What is the best way to measure the effectiveness or impact of forensic science and what is required to develop these metrics to inform decision making?

What is required to develop an effective framework for sharing data between agencies, including addressing barriers to the use of adaptable and scalable cloud technology?

What methodologies are available to capture and recreate crime scenes for re-assessment, presentation of evidence or education and training purposes?

What is the best way to report bloodstain pattern analysis and related DNA analysis results to ensure accuracy and consistency, and lay person comprehension?