



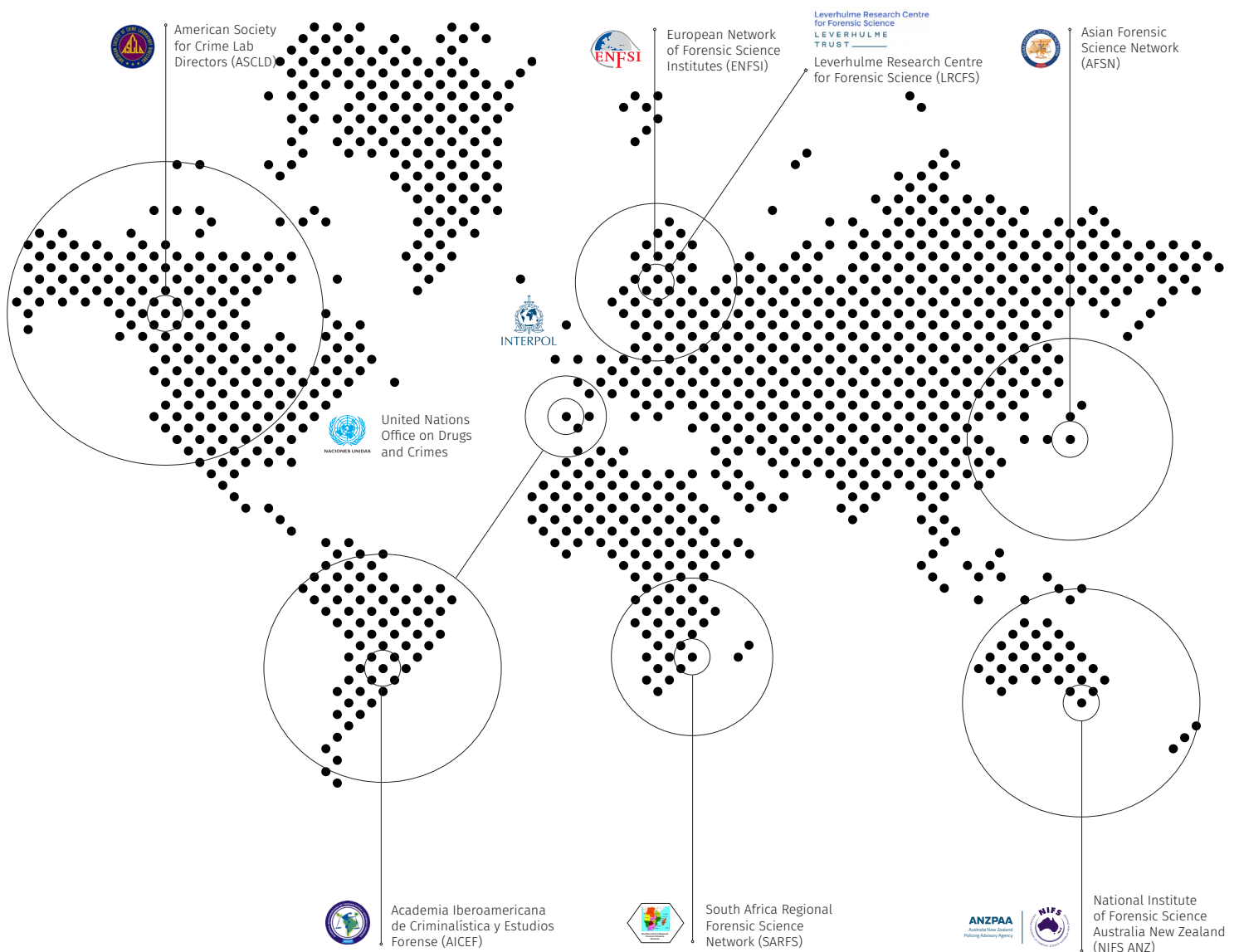
INTERNATIONAL FORENSIC STRATEGIC ALLIANCE (IFSA)

Research and Innovation
Position Statement
2021

About IFSA

IFSA consists of representatives of six world networks of leaders from forensic science government service providers. The networks represented on IFSA are: Academia Iberoamericana de Criminalística y Estudios Forense (AICEF), American Society for Crime Lab Directors (ASCLD), Asian Forensic Science Network (AFSN), European Network of Forensic Science

Institutes (ENFSI), National Institute of Forensic Science Australia New Zealand (NIFS ANZ) and South Africa Regional Forensic Science Network (SARFS). IFSA also has strategic partners from Interpol, United Nations Office on Drugs and Crimes (UNODC) and the Leverhulme Research Centre for Forensic Science (LRCFS).



More information regarding IFSA can be found at: www.ifsa-forensics.org



Position Statement Aim

The aim of this Position Statement is to provide leadership and promote research and innovation (R&I) in areas with operational relevance that are critical to scientific service provision for the justice systems. It is hoped the Position Statement will be used to promote funding and resources to research at National, International and Global levels.

The research and innovation areas are divided across a set of broad grand challenges of local, national and international significance with sub-topics which are defined as fundamental (need to be undertaken in the short, medium or long term) and applied (need to be applied into investigative and evidential processes for operational implementation spanning the criminal, civil and family justice systems). Research and innovation should be undertaken to cover the detection, recognition and comparison of materials and traces (including digital traces), the interpretation and evaluation of the meaning of those materials and traces within a case context, and the communication of evidence to the triers of fact. Funding bodies should emphasise the need for practitioners from across the investigative, scientific and justice ecosystem to be involved, where possible and appropriate, in devising and advising proposed research and innovation projects for maximum effectiveness. Practitioners could include, for example, forensic scientists, law enforcement, legal practitioners, policy makers or members of the public.

Publicly funded research should be ethical and transparently designed so as to minimise and mitigate bias and maximise scientific rigour addressing repeatability and reproducibility so as to enable evidenced and justified conclusions to be made. Publicly funded research outputs and data should (as far as possible and taking into consideration security and commercial interests and sensitivities) be openly and freely available so as to facilitate knowledge discovery and data re-use. Data should be uniquely identifiable and stored in such a way that it is accessible and retrievable to researchers and practitioners. Data generated through publicly funded research should strive to follow the FAIR principles (<https://www.go-fair.org/fair-principles/>); Findable, Accessible, Interoperable and Re-useable, while acknowledging that commercial interests and confidentiality may also be required.

The Position Statement is broken down into specific research and innovation focus areas. These focus areas are presented in no particular order. Under each focus area the identified and agreed fundamental and applied research required to progress the focus area is listed:



Focus Areas
Fundamentals of forensic science

Transfer, persistence & background abundance



Focus Areas
Human factors

Data sharing across jurisdictions



Focus Areas
New tools for scene investigation & laboratories

Biometrics



Focus Areas
Emerging technologies & industry 4.0

Applications of artificial intelligence (AI)



Focus Areas
Emerging biological & chemical evidence types 'omics'



Strengthening Foundations



Developing Capability



Advancing Science



Focus Area:**Fundamentals of Forensic Science**

Despite continuous improvements there is still a need to develop robust and valid scientific data to enhance forensic science practice in a range of areas. This includes the characterisation of the empirical foundations underpinning some forensic science techniques.

Sub-Topic Fundamental

1. Understanding error rates in subjective and interpretative analysis involving pattern recognition of feature comparison (for example, but not limited to, fingerprint comparisons, ballistics comparisons, tool mark comparison, comparison of shoeprints, chemical profiling).
2. Development of local, National and International ground truth data sets across a range of evidence types for source and activity inferences.
3. Understanding and developing reporting mechanisms for scientific results to reflect limitations, uncertainty and error rates in the weight and strength of those results.
4. Providing objective evidence that testing methods are fit for purpose and that the results derived can be relied upon in judicial processes.

Focus Area:**Transfer, persistence and background abundance**

Understanding how materials transfer from one surface to another, how they persist once transferred and the background abundance of materials is fundamental to the interpretation of evidence in scientific investigations. This is a critical aspect of understanding what activities may have been responsible for the presence of the material. There is an absence of harmonized datasets or mathematical modelling to support such understanding.

Sub-Topic Fundamental

1. Development of data sets to support interpretation at the activity level for trace evidence (paint, glass, etc.), biological traces (body fluids, DNA), chemical traces (explosives, drugs, ignitable liquids, etc.) and biometric traces (fingermarks, shoemarks, CCTV footages).
2. Modelling the transfer and persistence of different trace evidence between a range of substrates.
3. Development of an understanding of the transfer, persistence and background abundance of digital information (for example, images, text messages or the dynamic signature of digital devices communicating between them (bluetooth, wifi, 3-4-5G, peer-to-peer)) which may exist on a variety of electronic devices and which may be associated with alleged events or provide corroborating evidence.
4. Development of the ability to recognise new signals from modern sensors or trace capturing solutions.



Focus Area:**Human factors**

Understanding how human interaction impacts on decisions at all levels of an investigative process is critical for the development of safe justice outcomes.

Sub-Topic Fundamental

1. Understanding the impact of various types of biases (beyond confirmation and contextual bias) on practical decision making across all practitioner types from the scene to the courtroom within the justice systems by exploring risk in decision-making and harnessing knowledge in other fields such as medicine, engineering and across the social sciences.
2. Developing new and innovative tools to fully communicate the meaning, interpretation, evaluation and weight of scientific evidence in understandable ways to non-scientists.
3. Development of new innovative communication pathways between law and science harnessing the knowledge base within the science communication and engagement fields.
4. Understanding of the use and misuse of scientific data as it relates to investigative and legal decision making.

Focus Area:**Data sharing across jurisdictions**

Differences in data collection methods and file formats hinder the exchange of information, vital to maximizing the use of forensic analysis and comparison across agencies and jurisdictions.

Sub-Topic Fundamental

1. Developing a forensic science data classification system (Onthology) to understand the interrelationship of data across evidence types and overcome barriers to data collection, categorisation and exchange, Nationally and Internationally.
2. Development of common legal and scientific lexicon.



Focus Area:**New tools for scene investigation**

Documenting, recording and analysing scenes needs to change and evolve to incorporate the investigative opportunities provided by developments in point of response analysis and developing digital technologies. Opportunities for new communication and case presentation methods to improve value and interpretation in the courts also need to be explored and harnessed.

Sub-Topic Fundamental

1. Development of new methodologies relating to digital evidence connected to scenes.
2. Development of new robust and contactless tools for physical (spectroscopic and analytical) and digital environments for identifying and recording evidence at crime scenes.
3. Development of Virtual reality and augmented reality processes for scene investigation, evidence presentation and training.

Sub-Topic Applied

1. Integration of new technologies for case presentation.
2. Application of new point of response devices for analysing evidence.

Focus Area:**Biometrics**

Biometrics allows a person to be identified and authenticated based on a set of recognisable and verifiable data, which are unique and specific to them.

Sub-Topic Fundamental

1. Developing investigative and evidential automated and scalable tools for human identity verification processes.
2. Establishing an acceptable ethical use of biometrics, including data protection and privacy within the criminal justice framework.

Sub-Topic Applied

1. Conversion and standardisation (data and processes) of commercially available biometric tools for use in the judicial systems, including an understanding of the limitations of such techniques.
2. Exploring the exchange of biometric data and interoperability of systems and the risk of direct adoption of existing biometrics tools for use in the justice system particularly in relation to ethical issues.



Focus Area:**Emerging Technologies and Industry 4.0**

As new science and technology innovations occur, it will create new requirements for forensic services. The following represent areas for consideration in defining emerging requirements.

Sub-Topic Fundamental

1. Accessing and analysing data on the cloud.
2. Developing Virtual and augmented reality capabilities.
3. Developing wearable technologies as novel sensors, detectors and recording devices.
4. Exploring the usefulness of the Internet of Things and other developments in digital technology and data analytics as it applies within and across justice systems.

Sub-Topic Applied

1. Devising new methods to facilitate data sharing across jurisdictions.
2. Developing robust methods to convert existing subjective techniques into new objective methods.

Focus Area:**Applications of artificial intelligence (AI)**

AI is an umbrella term for explaining advanced computer intelligence. It summarises the efforts to simulate human cognitive thinking and decision-making, leading to machines able to use experience

Sub-Topic Fundamental

1. Using AI as the corner stone technology for the automation of comparison of forensic data, to address subjectivity and to make interpretations objective and subsequently, more accurate, characterising their limitations (for example, but not limited to, interpretation and evaluation of fingerprint comparison, shoeprint comparison, ballistic and toolmark comparison, chemical profiling, blood pattern analysis, fire pattern analysis).
2. Using AI and data analytics to address data analysis related to the extraction, interpretation and evaluation of information (in all forms) derived from digital devices.

Sub-Topic Applied

1. Integration of the results of AI methods into the forensic investigative (link cases) and evidential (assign weight of evidence) processes, to improve and accelerate the workflows.



Focus Area:**Emerging biological and chemical evidence types ‘-omics**

Novel methods of analysis (‘-omics’) can lead to the identification of large molecules such as proteins or metabolites which can provide information about people and/or their environment.

Sub-Topic Fundamental

1. Establishing new capabilities for human identification.
2. Establishing new capabilities for the interpretation of causes of death.
3. Understanding the distribution and significance of peptides, lipids and/or metabolites which may be measured in association with an alleged set of activities.

Sub-Topic Applied

1. Translation of existing technologies (for example in sport/racing doping or personalised medicine) to address justice questions.



IFSA Members



Strategic Partners



CONTACT:

International Forensic Strategic Alliance:
<http://www.ifsa-forensics.org>