My experiences that support Sydney Declaration

No Silver Bullet but lots of tools
Sheila Willis

1

"There is the general hope, pervading much of our society (and to which scientists are not immune) that new technologies will offer dramatic, plug-and-play improvements to long-standing problems. "

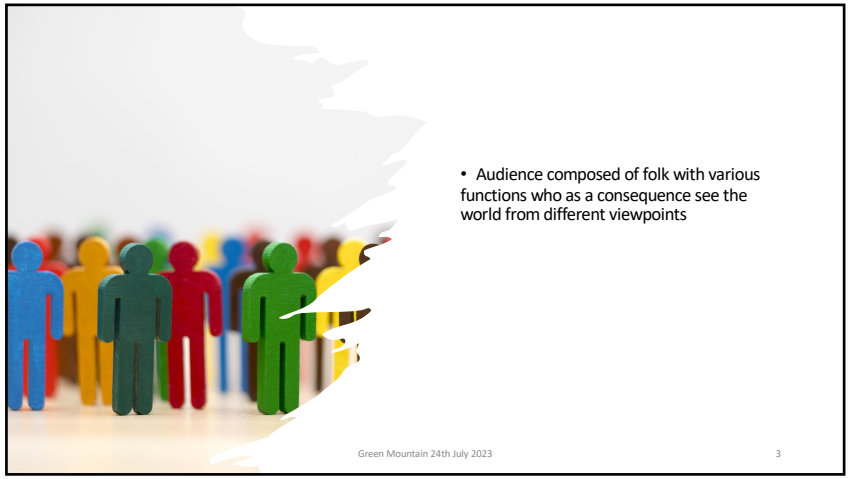
Critical review of forensic trace evidence analysis and the need for a new approach

David A. Stoney *, Paul L. Stoney

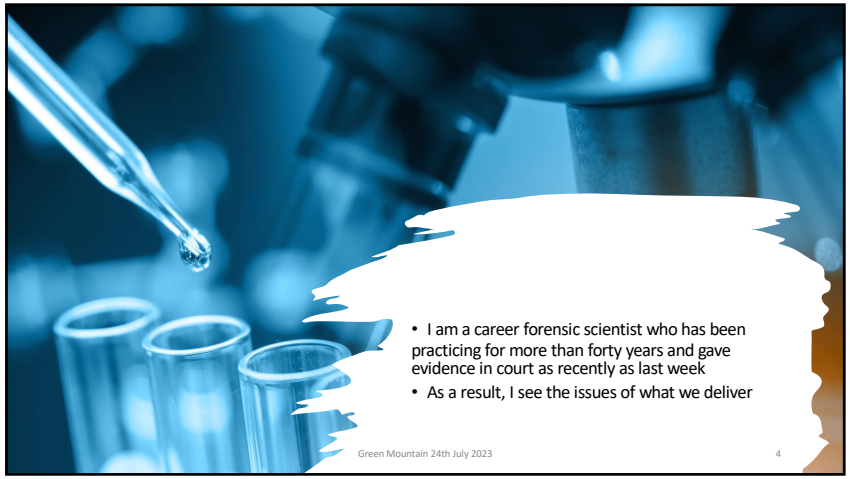
Forensic Science International 251 (2015) 159–170

"The component-based frame of mind can also be susceptible to a number of phantom contributions that may appear to be inherently beneficial, but are not. These include (1) the perception that improvement in any component process represents an improvement in the capability, (2) the hope that new technologies can provide quick plug-and-play solutions, and (3) the hope that a specific new technology can become a universal solution to all problems."

2


• Audience composed of folk with various functions who as a consequence see the world from different viewpoints
Green Mountain 24th July 2023
3

3


• I am a career forensic scientist who has been practicing for more than forty years and gave evidence in court as recently as last week
• As a result, I see the issues of what we deliver
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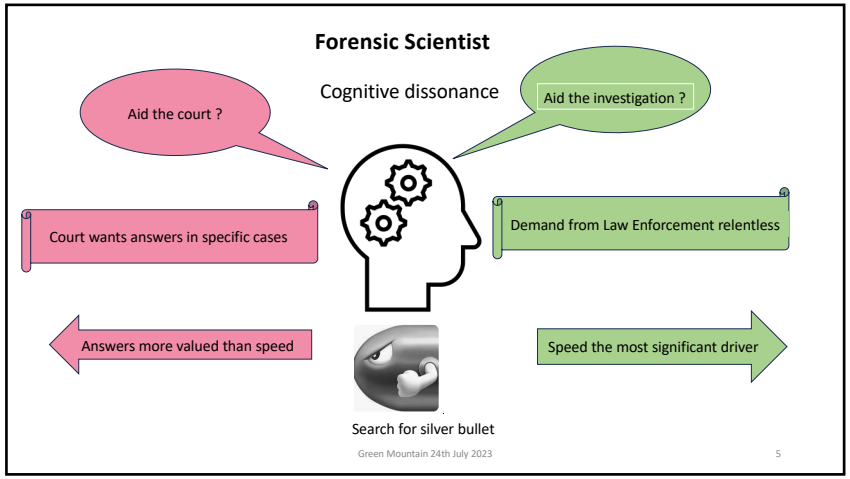
4

4


Forensic Scientist
Cognitive dissonance
Aid the court ?
Aid the investigation ?
Court wants answers in specific cases
Demand from Law Enforcement relentless
Answers more valued than speed
Speed the most significant driver
Search for silver bullet
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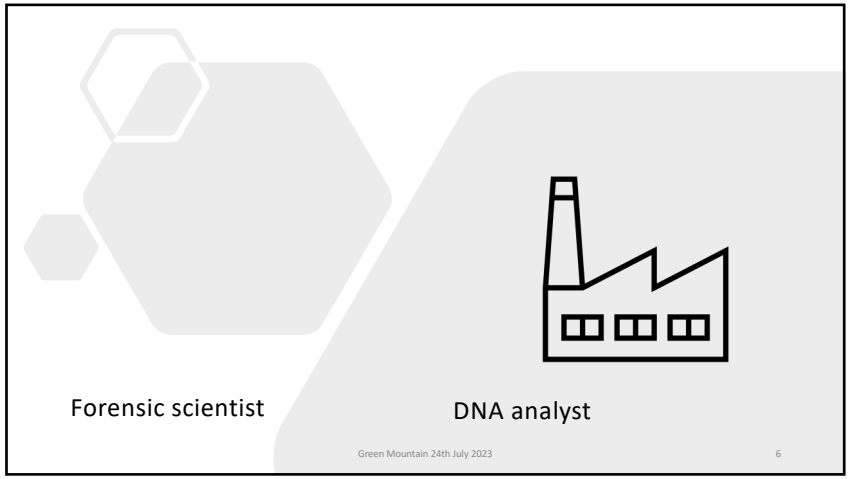
5

5


Forensic scientist
DNA analyst
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6

6

Traces generated by activity

Findings out of context may be misleading

Focus of research

Traces are the vectors of information

Scene | transport | prioritize | laboratory | report | court

Identifying relevant traces not trivial

High uncertainty
Limited controls
Little research

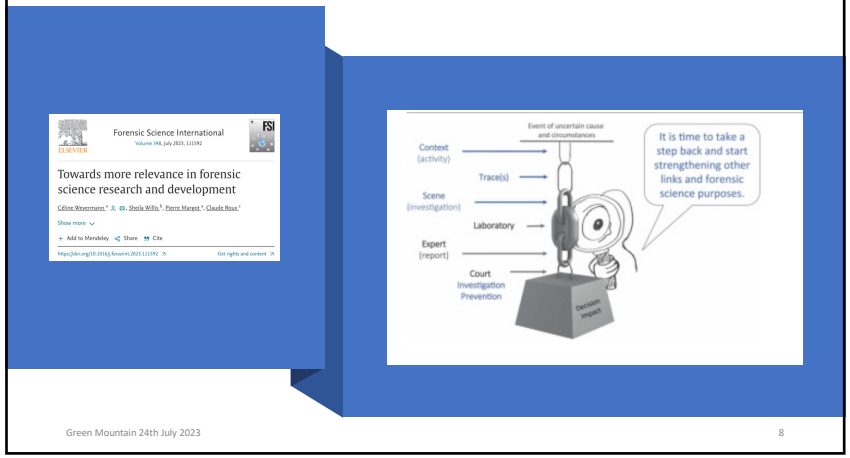
Little explicit information on basis of triage

High controls and protocols

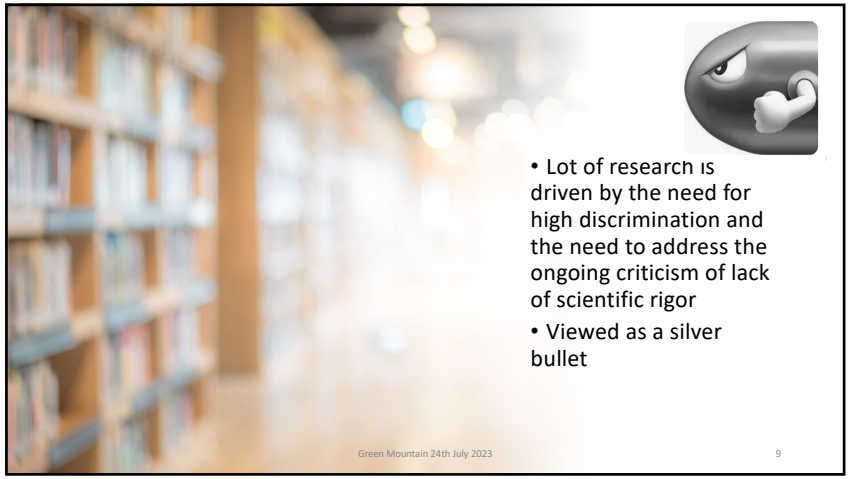
No universal agreement

Few controls

7



8


• Lot of research is driven by the need for high discrimination and the need to address the ongoing criticism of lack of scientific rigor
• Viewed as a silver bullet
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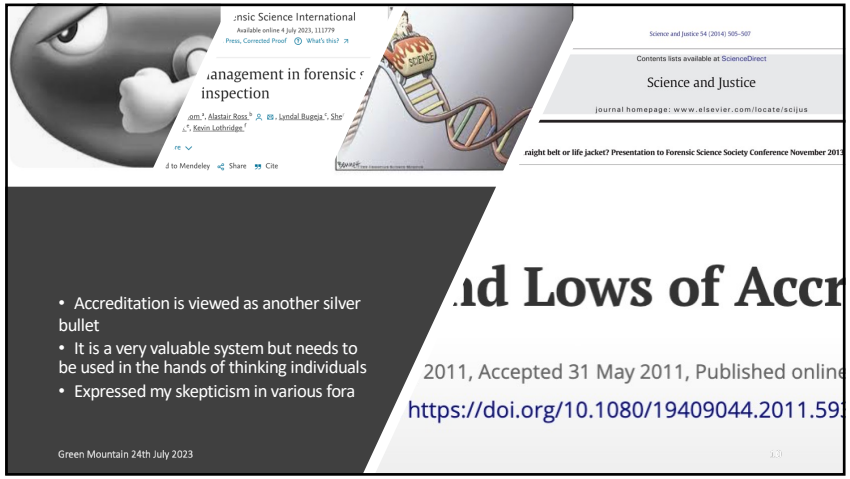
9

9


:nsic Science International
Available online 4 July 2023, 111779
Press, Corrected Proof
What's this?
anagement in forensic
inspection
Alastair Ross
Lyndal Bugeja
Kevin Lothridge
d to Mendeley
Share
Cite
Science and Justice 54 (2014) 505–507
Contents lists available at ScienceDirect
Science and Justice
journal homepage: www.elsevier.com/locate/scijus
raight belt or life jacket? Presentation to Forensic Science Society Conference November 201
• Accreditation is viewed as another silver bullet
• It is a very valuable system but needs to be used in the hands of thinking individuals
• Expressed my skepticism in various fora
Green Mountain 24th July 2023
2011, Accepted 31 May 2011, Published online
https://doi.org/10.1080/19409044.2011.59

10

QUALITY ASSURANCE IN FORENSIC SCIENCE*

MARGARET PEREIRA

Home Office Forensic Science Service, Horseferry House, Dean Ryle Street, London SW1P 2AW (U.K.)

(Received December 24, 1984)
(Revision received February 26, 198
(Accepted February 28, 1985)

*Presented at a Plenary Session of the 10th Meeting of the International Association of Forensic Sciences, Oxford, September 1984.

(1) The promotion of a uniformly high standard of performance by all concerned in situations which range from the examination of scenes of crime to the presentation of evidence in courts.
(2) The identification and correction of problems which arise.
(3) A continuing review of analytical methods, procedures, equipment and data in use in order to determine the best available.
(4) The education and encouragement of all staff, thereby ensuring an efficient and effective programme.

11

Two of the plenary lectures I recall from the 1984 IAFS conference

Stuart Kind

Margaret Pereira

Integration with the investigation
Recommended Byford Scientist
Scientific Support Managers introduced –
Purpose was to act as a bridge between laboratory and investigation
Could be seen to have become a wall

Quality in the laboratory
Influenced forensic science across the world for the next 36 years

12

Lack of Principles

"With all of the progress that has been made in this field, and on a wide front, careful examination shows that for the most part, progress has been technical rather than fundamental, practical rather than theoretical, transient rather than permanent. "

Journal of Criminal Law and Criminology

Volume 54
Issue 2 *June*

Summer 1963

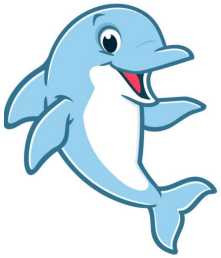
The Ontogeny of Criminalistics

Paul L. Kirk

13

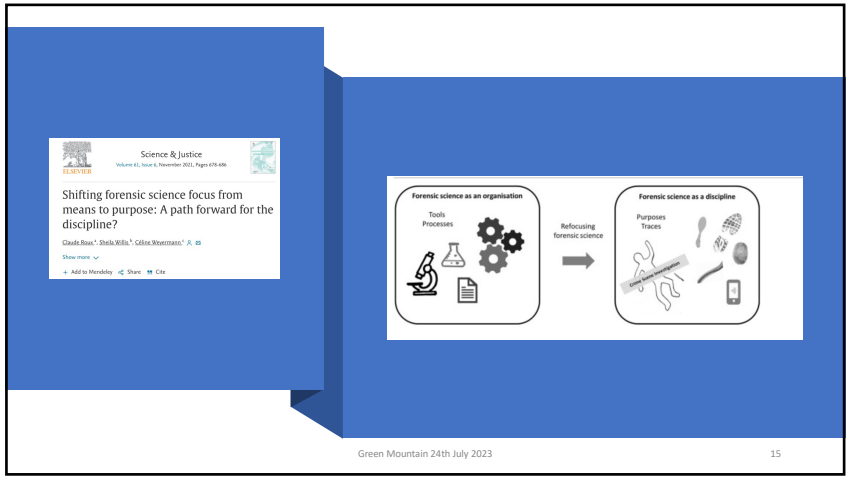
In the absence of principles, it is possible to consider purpose

Purpoise



Purpose needs to be clearer than examine the scene or "do a forensic examination"

14


Science & Justice
Shifting forensic science focus from means to purpose: A path forward for the discipline?
Forensic science as an organisation
Tools
Processes
Refocusing forensic science
Forensic science as a discipline
Purposes
Traces
Green Mountain 24th July 2023
15

15


At a minimum we need to ensure we are answering the correct question.
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16

16

- Not confined to Forensic Science but important that we recognize it
- Sub source level DNA to address how did it get there?

On the Folly of Rewarding A, While Hoping for B

STEVEN KERR
Ohio State University

Illustrations are presented from society in general, and from organizations in particular, of reward systems that "pay off" for one behavior even though the rewarder hopes dearly for another. Portions of the reward systems of a manufacturing company and an insurance firm are examined and the consequences discussed.

17

Crime investigation raises lots of questions.

Who?

Why?

What?

Where?

When?

How?

Forensic Scientists have been very good at answering the who question

This is particularly the case since 1984

The increased sensitivity of DNA profiling reduced the link between the profile and the relevance to the case

Who? ⤫ Who did it?

This tendency to answer the easier question has been termed attribute substitution, "if someone doesn't know the answer to a difficult question, they will substitute and easier question (even if subconsciously) and answer that instead" (Eldridge 2019)

ELDRIDGE, H. 2019. Juror comprehension of forensic expert testimony: A literature review and gap analysis. *Forensic Science International: Synergy,* 1, 24-34.

18

- Lack of agreement as to what constitutes forensic science
- Lack of agreement as to what are the issues
- Solutions offered and initiatives. Put in place which are not solving the problems

19

Sydney Declaration

- **Forensic Science Definition**
- *Forensic science is a case-based (or multi case-based) research-oriented, science-based endeavor to study traces – the remnants of past activities (such as an individual's presence and actions) – through their detection, recognition, recovery, examination and interpretation to understand anomalous events of public interest (e.g., crimes, security incidents).*

Contents lists available at ScienceDirect
Forensic Science International
journal homepage: www.elsevier.com/locate/forsciint

The Sydney declaration – Revisiting the essence of forensic science through its fundamental principles

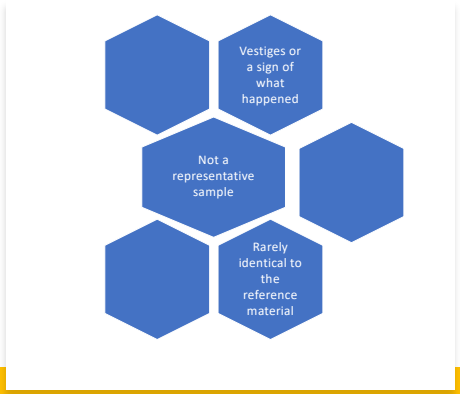
Claude Roux[a], Rebecca Bucht[b], Frank Crispino[c], Peter De Forest[d], Chris Lennard[e], Pierre Margot[f], Michelle D. Miranda[g], Niamh NicDaeid[h], Olivier Ribaux[i,*], Alastair Ross[j], Sheila Willis[h]

My experiences prompted me to contribute to the formulation of the Sydney Declaration the very definition of which is in opposition to a silver bullet

20

Principle 1

Activity and presence produce traces that are fundamental vectors of information



21

Type of material

Dr. Edmond Locard

1877- 1966

Could think of Locard as the origin of micro trace - "every contact leaves a trace"
Possible to argue that this catch phrase has dominated the field to its determent

"It is impossible for a criminal to act, especially considering the intensity of the crime, without leaving traces of this presence "

The actual quote takes activity into consideration

vestige

22

The author(s) shown below used Federal funding provided by the U.S. Department of Justice to prepare the following resource:

Document Title: Combined Genetic and Micro-Chemical Analysis of Household Dust as a Definitive Trace Identified of a Room and its Occupants
Author(s): Jack Ballantyne, Erin Hanson, Nick Petraco
Document Number: 252770
Date Received: March 2019
Award Number: 2013-DN-BX-K025

Dust

Holistic approach

Break into individual components

Need methods to deal with extrinsic factors

Employ methods to deal with complexity

Disconnect between ability to analyze and find meaning

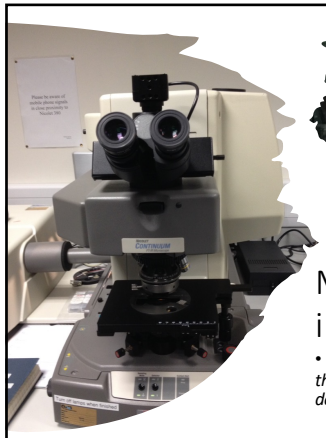
Disconnect between relevant forensic questions and results

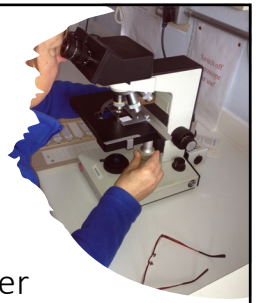
Standardization

Improve the ability to deal with very small samples

Focus on glass for example

23





Microscope v other instruments

- *The meticulous and thorough nature of the work required in the segregation and examination of microscopic evidence is a deterrent to its general use.”* - Kirk

24

Trace Evidence	ILAC-G19:2002
Fire debris Oils and greases	Hydrocarbon fuels Cosmetics
Pyrotechnic devices Lachrymatory chemicals	Explosives and explosion debris Soils Botanical material restoration
Glass Fertilizers	Light filaments Corrosives
Paint Acids	Vehicle components Alkalis
Metals and alloys Food	Firearm discharge residues Lubricants and spermicidal agents
Fibres and hairs Feeding stuffs and ancillary items	Clothing/garments Electrical devices and components
Adhesives Components of technical or household appliances	Dyes and pigments Manufacturers marks (incl serial number

Type of material

DNA NOT INCLUDED?

25

Principle 1

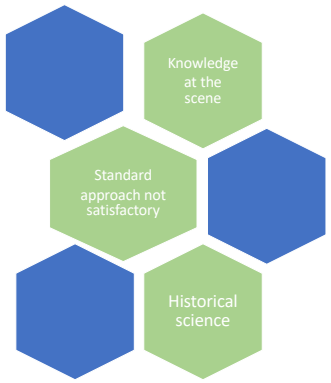
Activity and presence produce traces that are fundamental vectors of information

A precondition for a forensic science investigation is that activities cannot occur without leaving traces. Sometimes they are left at the scene; sometimes they are taken away (Locard's exchange maxim). The nature of the activity influences the types of items that are exchanged, and how and where they are dispersed in the environment. This item(s), a remnant of the investigated activity, is the trace. The trace is a vector of information that is capable of being detected, recovered, examined and interpreted. The traceability of human activities is rapidly changing in our digitalised (i.e., combined physical and digital) environment. The place of forensic science is therefore increasingly central to studying events of public interest, which are themselves in transformation.

26

Principle 2

Scene investigation is a scientific and diagnostic endeavour requiring scientific expertise

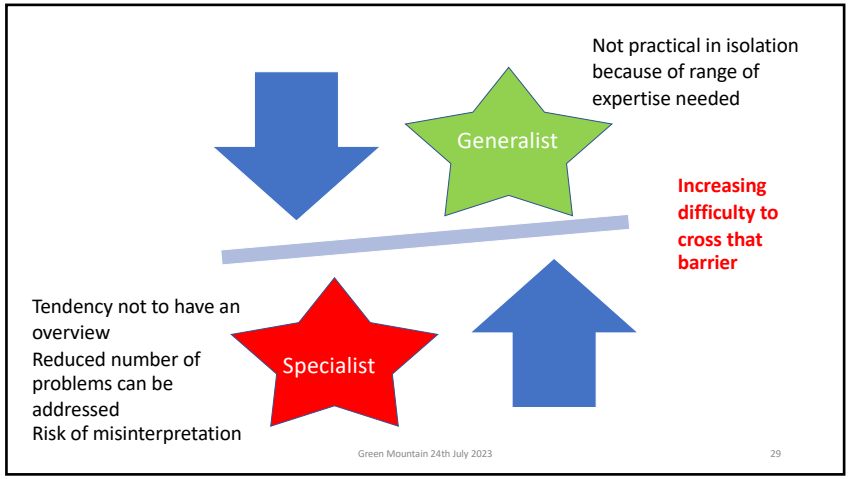


27

Attempts to find the silver bullet
Little emphasis on recovery

Sample/ material	Processes	Outside influences
• Reduce the type of material we examine • Smaller and smaller samples • Seek increased discrimination	• Divided work flows into types of material • Divided work flows into types of instrument	• Standardization • Accreditation • New technologies

28


Not practical in isolation because of range of expertise needed
Generalist
Increasing difficulty to cross that barrier
Tendency not to have an overview
Reduced number of problems can be addressed
Risk of misinterpretation
Specialist
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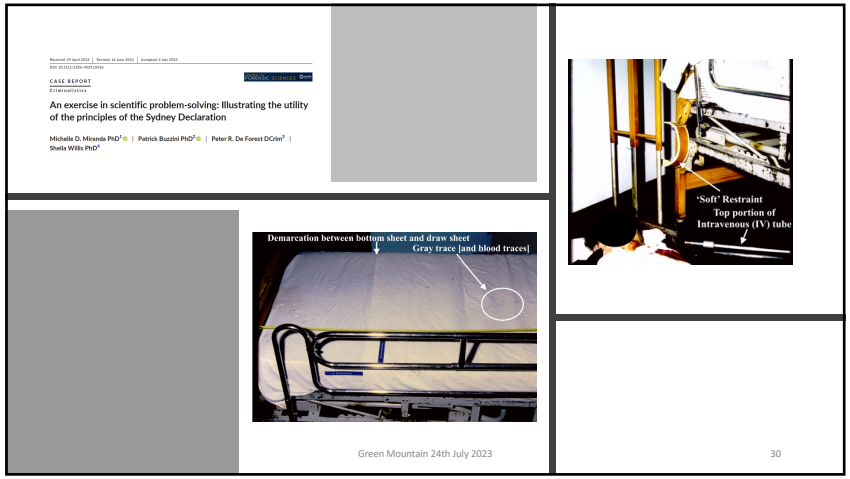
29


CASE REPORT
An exercise in scientific problem-solving: Illustrating the utility of the principles of the Sydney Declaration
Demarcation between bottom sheet and draw sheet
Gray trace [and blood traces]
'Soft' Restraint
Top portion of
Intravenous (IV) tube
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30

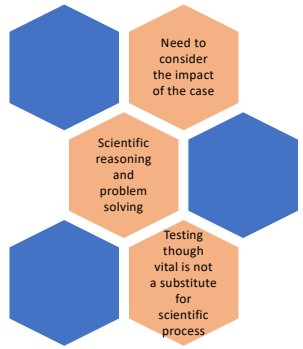
Principle 2
Scene investigation is a scientific and diagnostic endeavor requiring scientific expertise

The goal of the scientific investigation at the scene is to infer (i.e., reasoning under uncertainty) the reconstruction of an event through the study of the surviving traces. The site of an event is where relevant traces can be recognised and characterised with respect to their relative position that may be indicative of sequence, orientation and interaction. This information combines to help understand a limited number of potential explanations relative to the traces that need further examination and interpretation in the reconstruction and identification processes. This complexity requires a trained mind with broad science knowledge and with powerful and proficient observation and detection skills that may be extended by various scientific tools.

31

Principle 3

Forensic science is case-based and reliant on scientific knowledge, investigative methodology and logical reasoning



32

- *"The generation of observations is a technical process and the advances that have been made in forensic science techniques over the last 50 years have been staggering.* ***But science is about reasoning—about making sense from observations****. For the forensic scientist, this is the challenge of interpreting a pattern of observations within the context of a legal trial."*
- Evett, I., *The logical foundations of forensic science: towards reliable knowledge.* Philosophical Transactions of the Royal Society B: Biological Sciences, 2015. **370**(1674): p. 20140263.

33

Rodolphe Archibald Reiss

Born Archibald Rudolph Reiss
8 July 1875

Started the course at University of Lausanne

Position of hands as significant as the finger marks

34

- The topic of sense-making cannot be addressed adequately by looking at the empirical evidence only; it rather requires room for **interpretation** and (inter-)- **subjective judgement.**
- The question of what counts as a 'success' or a 'failure' of scientific advice for policymaking cannot be determined without referring to interpretation and judgement..

35

- Need to review inferences in light of different information – recent case
- Number of items excluded during legal arguments
- Do the conclusions change
- Value of the LR
- Alternative proposition to be addressed affects the value of the LR

36

Principle 3

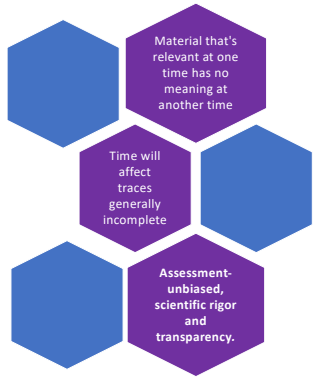
Forensic science is case-based and reliant on scientific knowledge, investigative methodology and logical reasoning

Traces constitute signs and forensic science engages a scientific process to investigate and understand the meaning of these signs with their ambiguities, misperceptions and strengths. This engagement involves asking relevant questions (mostly context dependant), making observations, forming propositions and testing those propositions[1]. This testing may include measurements facilitated by technology, but such tests are only an extension of the scientific process. The process is characterized by critical thinking, logical reasoning (deductive, inductive, abductive and analogical), problem solving and informed judgement. This approach is rendered ineffective – and perhaps even counterproductive – if it is not applied within a logical framework using a well-understood investigative methodology.

37

Principle 4

Forensic science is an assessment of findings in context due to time asymmetry



38

- Part of forensic science have parallels with other time related disciplines such as archelogy except in a different time frame
- Aim to shed light on a past event

39

- Forensic science is really **a historical science**
- In this context it is easy to see the vital role of the scene
- Don't think of an archeologists confined to the laboratory
- Many facets to be considered - how the trace is affected by time
- Particulate decay curves lose >80% of transferred material in the first hour
- In given situations inert material will last indefinitely
- DNA -Original user detected vast majority of experiments
  Varied depending on
  - Duration of use by second person
  - Substrate
  - Original handler – shedder status
  - Activities /action
  - Duration of use

40

Principle 4

Forensic science is an assessment of findings in context due to time asymmetry

In many instances, the quality of the trace resulting from an activity is such that it is incomplete, imperfect, and/or degraded by the passing of time, with such losses increasing uncertainty and often supporting only approximations concerning the past event under investigation. The ground truth remains in the past and is largely inaccessible. Forensic science can only be used to construct a model that is descriptive of a given scenario, explained by what is observed. The context is therefore essential. This is not a general model, but a specific retrodictive model that can only be inferential in nature. Forensic scientists cannot determine with certainty the definitive circumstances surrounding a trace, but only assess the relative value of associated findings under different plausible causes or scenarios. Such assessments should be unbiased and founded on scientific rigor and transparency.

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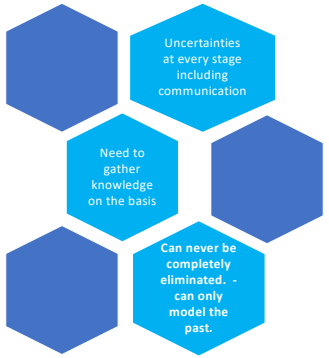
Principle 5

Forensic science deals with a continuum of uncertainties.



42

Reduction in ability to address relevant questions

Increase in knowledge

The more I learn about something, the more I realize how little I know

43

- The very words forensic science have in their entomology the expectation that the outcomes will be discussed and debated in the Forum so the uncertainty relating to how our communications are understood is vital

44

Principle 5

Forensic science deals with a continuum of uncertainties.

Forensic science deals with a continuum of uncertainties that are present at every step of the process that starts with the generation of traces and moves through all the steps up to the communication of the findings and value to the intended recipient (whether reported in written documents or in oral form such as their presentation in Court). Research is needed to identify and quantify these uncertainties with the knowledge that uncertainty will never be eliminated.

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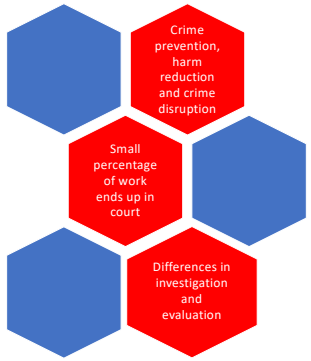
Principle 6

Forensic science has multi-dimensional purposes and contributions



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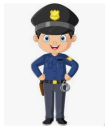
Evaluation

- Address the questions relevant to the court
- Assist the decision maker
- Use at least two hypothesis ideally at activity level
- Consider the information that will affect them



- **Investigation**
- Narrow the range of suspects
- Provide investigative leads
- Open ended information
- Sub source LR

An early paper illustrated this using case studies showing an LR based on activity level proposition was of the order of 1,000 while there is an infinite LR in favor of sub-level proposition.

EVETT, I. W., GILL, P. D., JACKSON, G., WHITAKER, J. & CHAMPOD, C. 2002. Interpreting small quantities of DNA: the hierarchy of propositions and the use of Bayesian networks. *J Forensic Sci,* 47, 520-30.

47

- Law must deal with binary decisions
- Probability is the language of science
- Need to make sure that we are not forced into return to categorical decisions
- Not binary – advise best knowledge at the time
- Spoke with a judge recently who was emphasizing that forensic scientists use inference – I suggested it was abduction
- When we discuss uncertainties tendency to also think they certainty is possible which of course it is not

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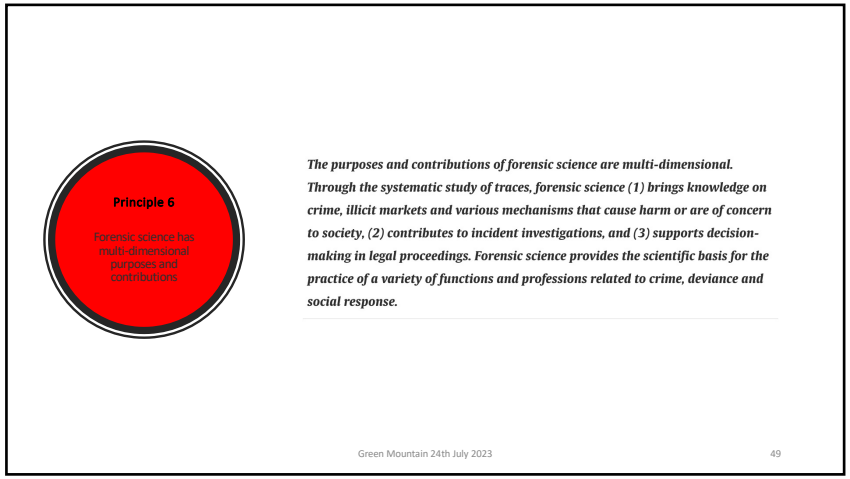
Principle 6
Forensic science has multi-dimensional purposes and contributions
The purposes and contributions of forensic science are multi-dimensional. Through the systematic study of traces, forensic science (1) brings knowledge on crime, illicit markets and various mechanisms that cause harm or are of concern to society, (2) contributes to incident investigations, and (3) supports decision-making in legal proceedings. Forensic science provides the scientific basis for the practice of a variety of functions and professions related to crime, deviance and social response.
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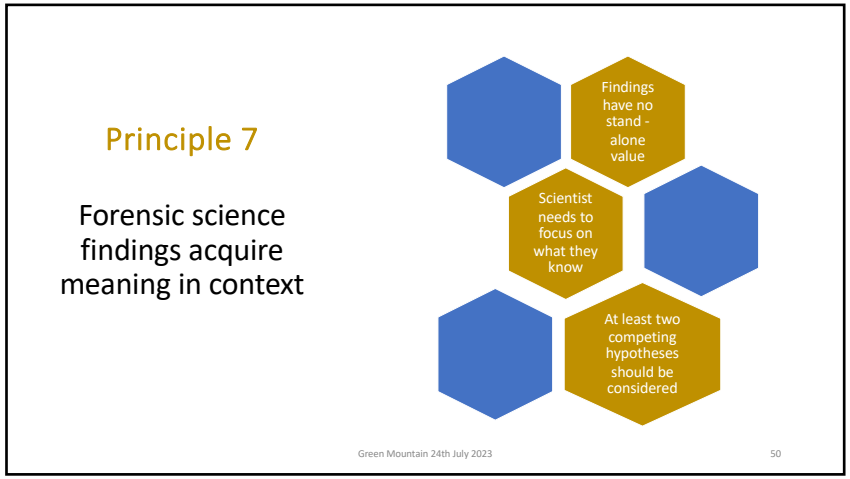
Principle 7
Forensic science findings acquire meaning in context
Findings have no stand - alone value
Scientist needs to focus on what they know
At least two competing hypotheses should be considered
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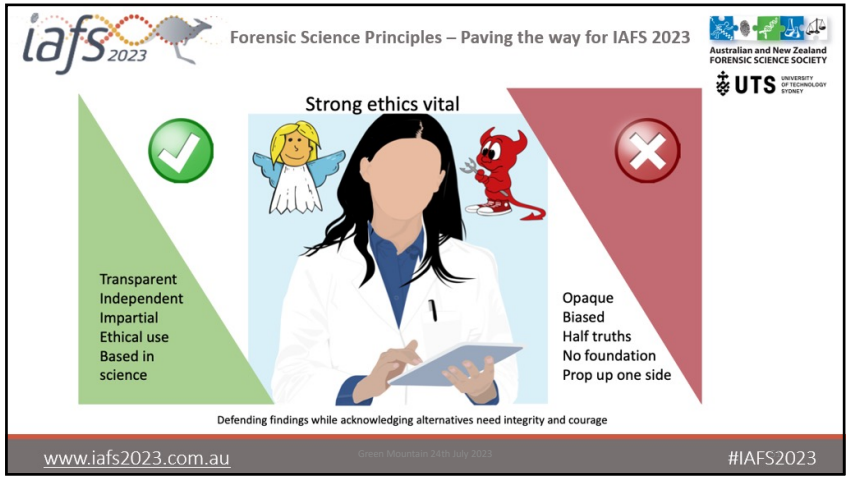
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Forensic Science Principles – Paving the way for IAFS 2023
Australian and New Zealand FORENSIC SCIENCE SOCIETY
UTS UNIVERSITY OF TECHNOLOGY SYDNEY
Strong ethics vital
Transparent
Independent
Impartial
Ethical use
Based in science
Opaque
Biased
Half truths
No foundation
Prop up one side
Defending findings while acknowledging alternatives need integrity and courage
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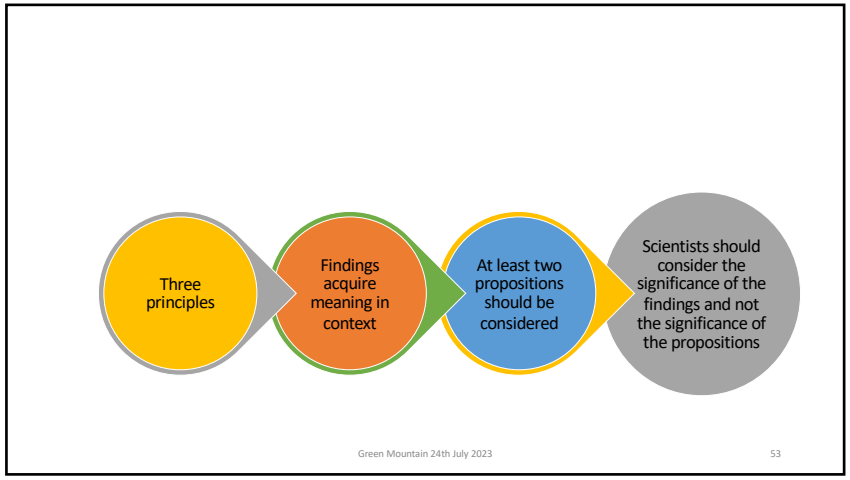
ENFSI GUIDELINE FOR EVALUATIVE REPORTING IN FORENSIC SCIENCE
A Primer for Legal Practitioners
ENFSI GUIDELINE FOR EVALUATIVE REPORTING IN FORENSIC SCIENCE
Strengthening the Evaluation of Forensic Results across Europe (STEOFRAE)
European Network of Forensic Science Institutes
ENFSI
With the financial support of the Prevention of and Fight against Crime Programme of the European Union European Commission – Directorate – General Justice, Freedom and Security
A project funded by the EU ISEC 2010
Agreement Number: HOME/2010/ISEC/MO/4000001759
An introductory guide to
Evaluative Reporting
Forensic Science Regulator
Codes of Practice and Conduct
Development of Evaluative Opinions
FSR-C-118
Issue 1
Published work based on the Case Assessment and Interpretation " Science
Cook, R., et al.
Sci Justice 38(4): 151-156
52

52


Three principles
Findings acquire meaning in context
At least two propositions should be considered
Scientists should consider the significance of the findings and not the significance of the propositions
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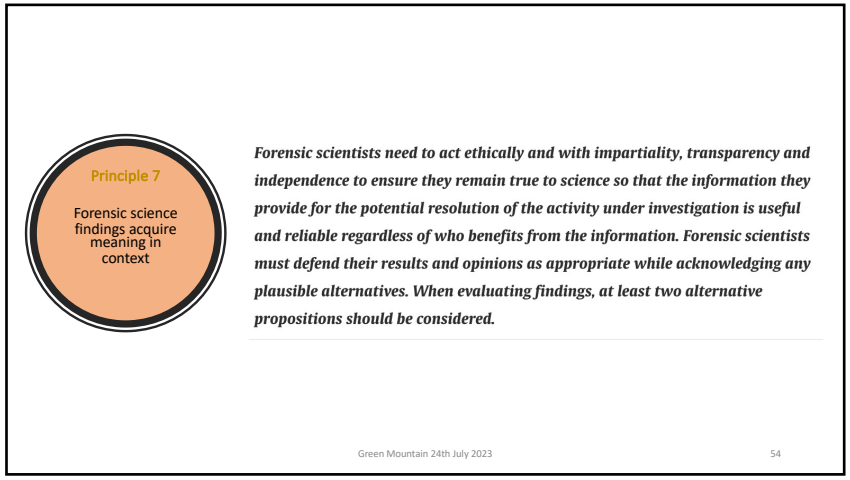
Principle 7
Forensic science findings acquire meaning in context
Forensic scientists need to act ethically and with impartiality, transparency and independence to ensure they remain true to science so that the information they provide for the potential resolution of the activity under investigation is useful and reliable regardless of who benefits from the information. Forensic scientists must defend their results and opinions as appropriate while acknowledging any plausible alternatives. When evaluating findings, at least two alternative propositions should be considered.
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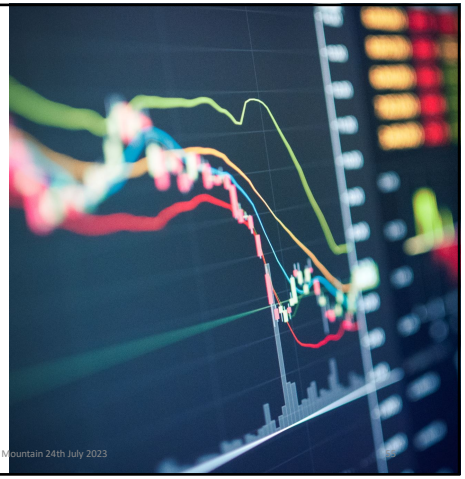
- Return to definition
- Case based or multi case based
- Research – does not lend itself to high throughput
- Present models of provision do not suit this reality
- No ideal that I am aware of
- High number of cases not contested – throughput suits but when it breaks down the results can be catastrophic
- FSS repeat re demin issues
- Queensland thousands of case to be reviewed

- FBI hair analyses
- Bullet lead stopped giving the "silver bullet " impression on the basis that if not absolute can't be used



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What's implicitly wanted

Quick results
High throughput
Black and white answers
No uncertainty
Little context
The silver bullet test

What's available

Lot of technology to compare materials
Very high sensitivity
Options for high throughput for some materials
Accreditation
Framework for evaluation
Less than ideal information on TPPR
Less than ideal agreement on purpose
Less than ideal relevant research
Definition and principles from SD to guide education, training and research

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• Aspiration is that we will not be here in 50 years time bemoaning the lack of principles
• Principles will be more widely accepted particularly in education which in turn should inform practice
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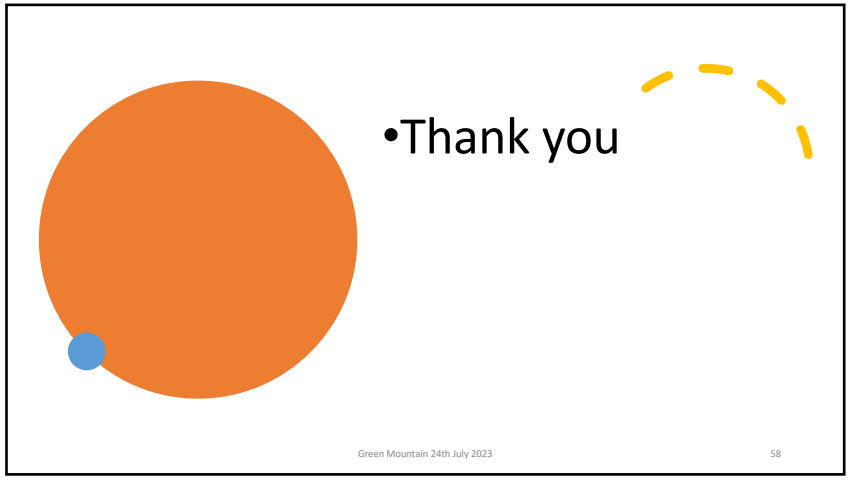
•Thank you
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Sydney, Australia
www.iafs2023.com.au
iafs2023@arinex.com.au
iafs2023
ANZFSS
Australian & New Zealand Forensic Science Society
UTS
UNIVERSITY OF TECHNOLOGY SYDNEY

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