NIST
National Institute of Standards and Technology
U.S. Department of Commerce

FORENSICS @ NIST | #NISTForensics

Lessons learned from "A Life in Crime"

Sheila Willis

FORENSICS@NIST #NISTForensics

Population 4.67m

32,595 sq miles

So you are a scientist?
So what does a forensic scientist do?

Predates the time of alphabet soup
idscna

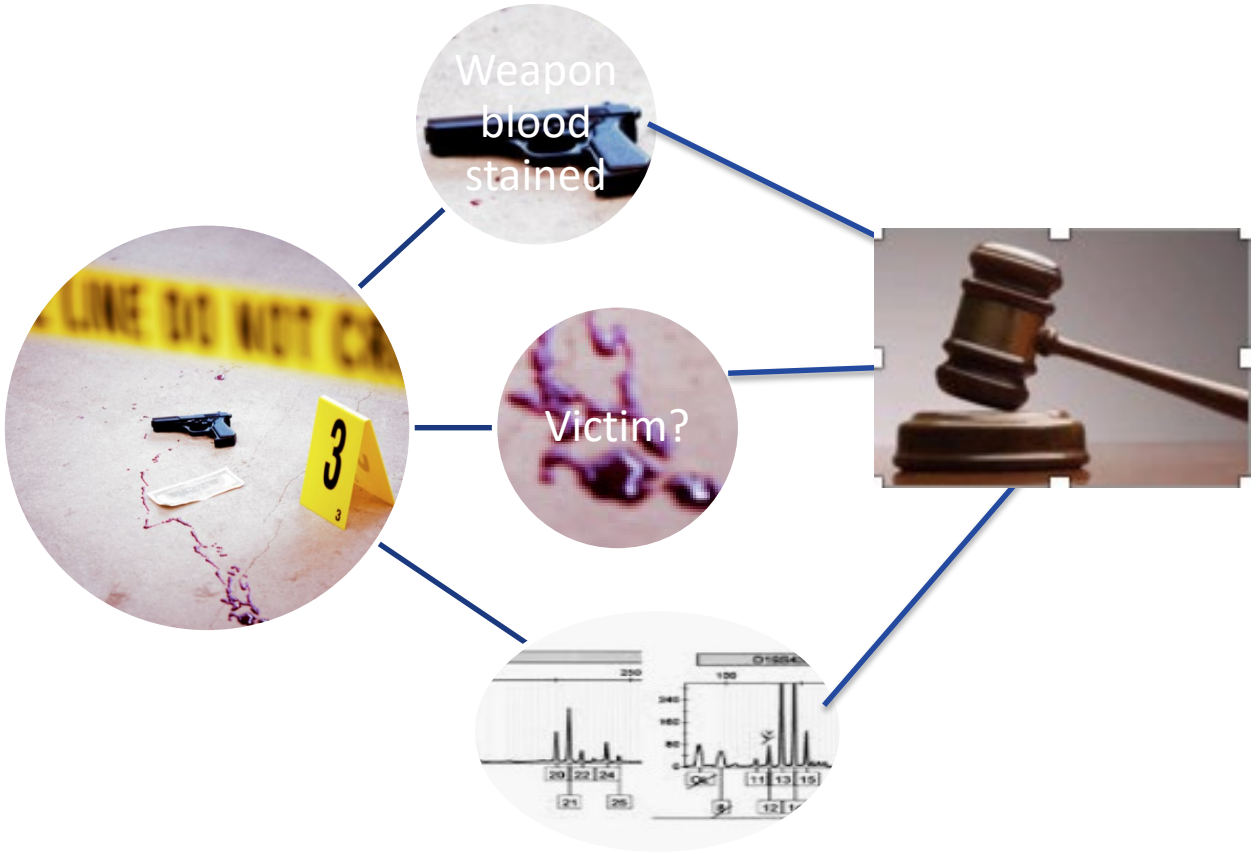
FORENSICS@NIST #NISTForensics

Measured effluent across the paper mill
Expected lot of variation across the factory

Found quite reproducible results
Wet water chemistry

Problem was the scene

Complexity of the scene



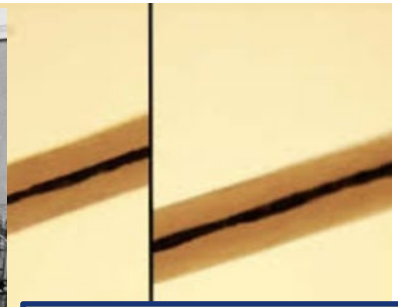
Murder of Lord Louis Mountbatten and others

Main evidence matching green paints

Court Experience

- Factual report; emphasis in report on technical details;
- Green paint – white paint – lots of paint
- Interest from the bench about the activity – didn't recognize this at the time;
- Black jacket"

Marita Ann



Political changes
Political issues in forensic science also

Intimidation
Trauma of human court
Last Drugs case
Need for solid science – not enough
3 types of witnesses

Risk assessment - Crime scene to court

Scene	Difficult to control	Implications for mistakes high
Transport	Easy to control	Implications for mistakes high
Prioritisation/ Pre-assessment	Interdependence needed for control	Mistakes reversible
Testing	**Controls variable**	**Implications for mistakes high**
Report writing/ Interpretation	High inter dependence for control	Mistakes reversible if detected – serious if not
Court	Difficult to control	Implications for mistakes high

accreditation

Growth industry
Concern re suitability for forensic science in isolation

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, 1985)
(Accepted February 28, 1985)

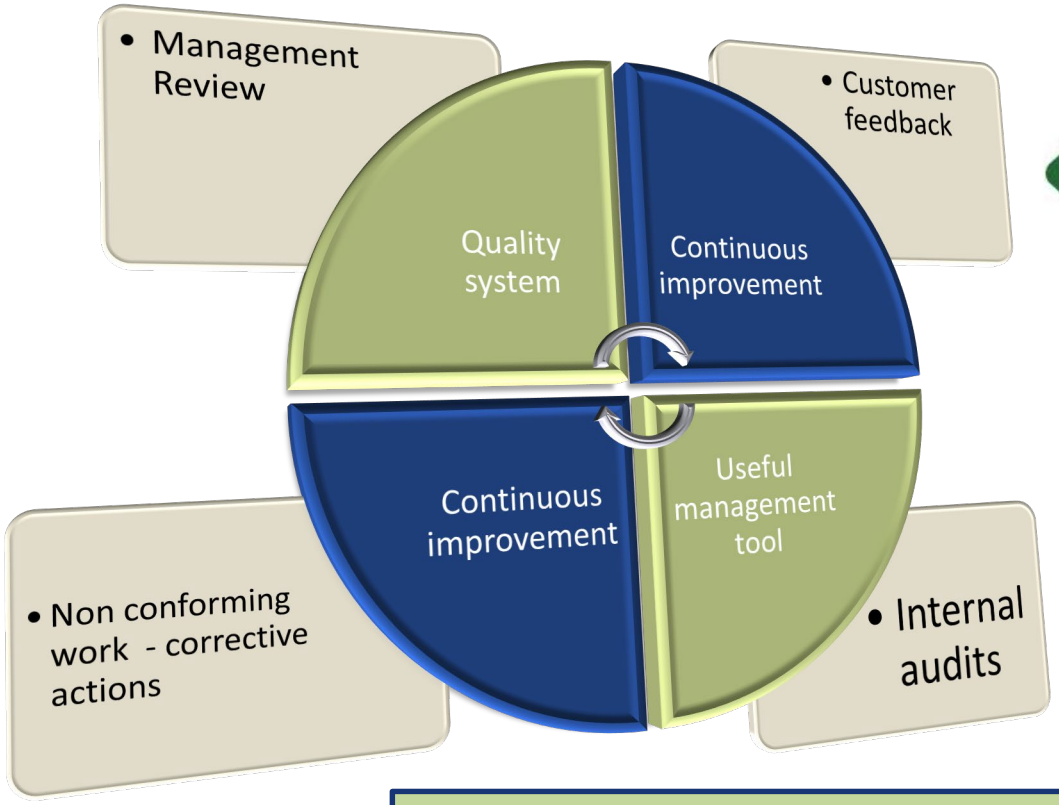
*Presented at a Plenary Session of the 10th Meeting of the International Association of Forensic Sciences, Oxford, September 1984.

(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.

Accreditation

Quality system Frame work for continuous improvement

Can be mistaken as guarantee for correct result



SOPs become too rigid
Everyone becomes too reliant on the value of the protocols and ignores judgement
Tasks are carried out to comply with the system rather than answer relevant questions
Personal responsibility/ownership abdicated to the system

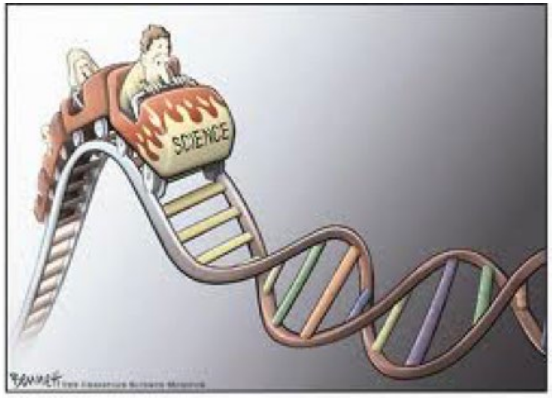
Personal Experience

Performance identified

> 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.

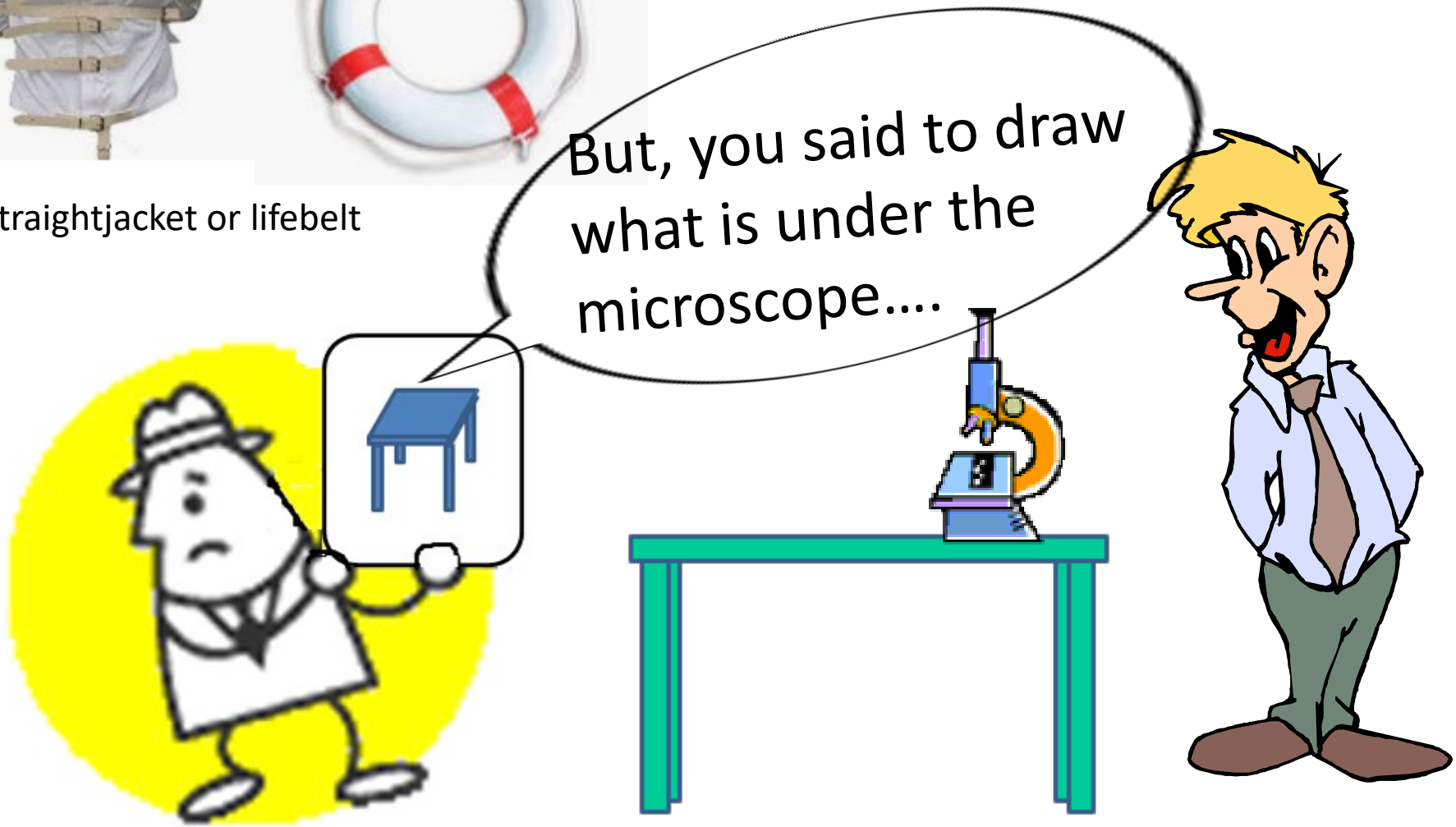
Journal article

- Documentation becomes overly complicated
- Staff develop perceptions of what is in documentation
- Rigid adherence to protocols when judgement requires different approach
- Sticking plaster approach v root cause

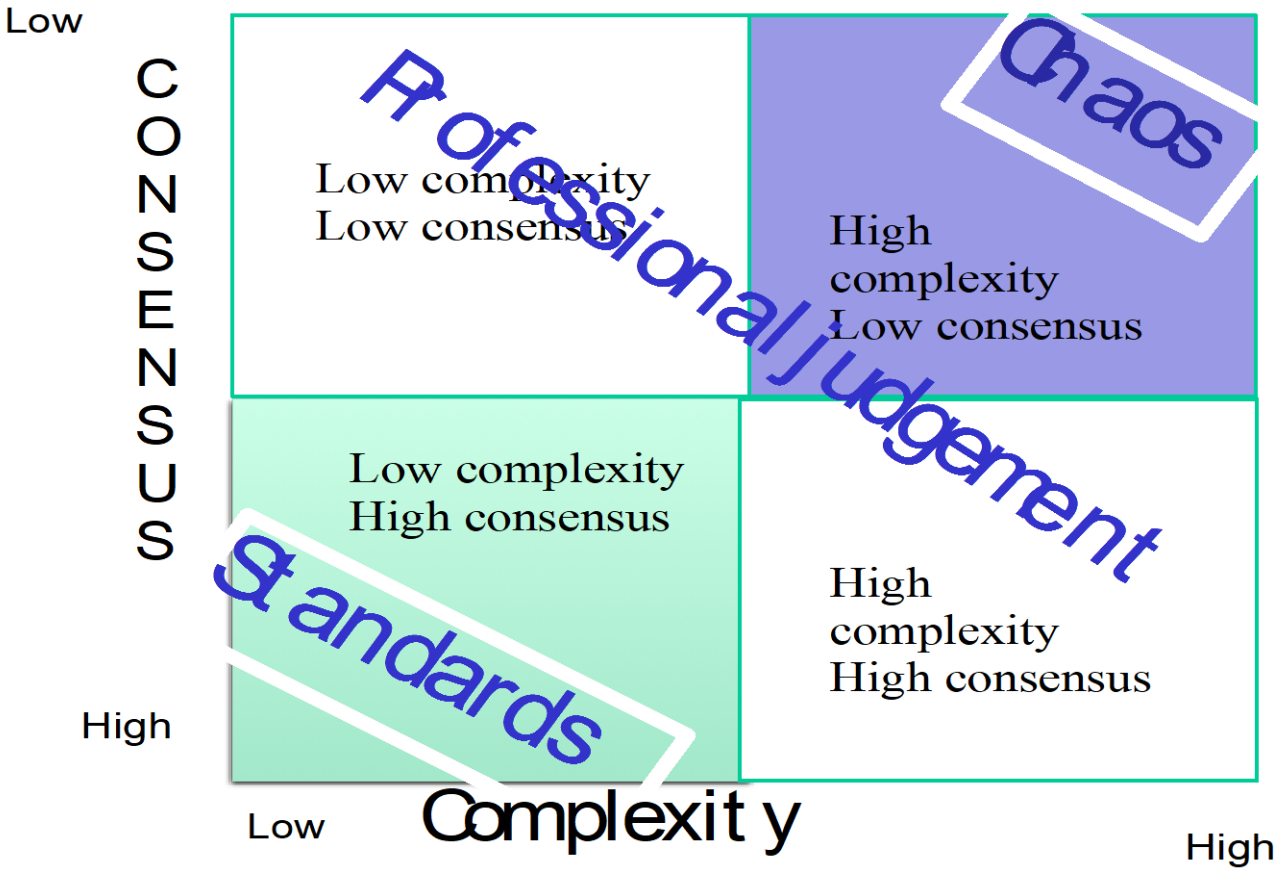


Value of accreditation taken for granted Not enough scientific skepticism in use Not enough emphasis on "Why"

Straightjacket or lifebelt

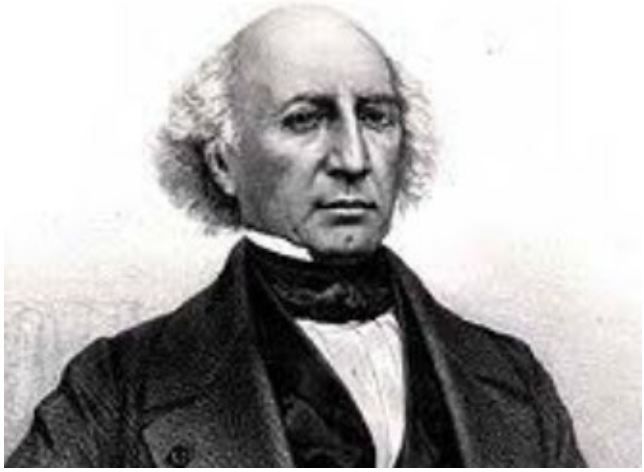


Principles rather than rule based approach



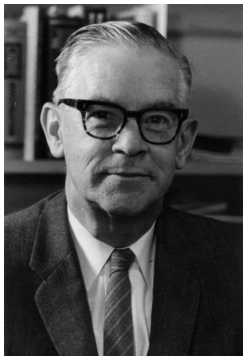
Learn from History?

- Forensic Science doesn't have a good record in transferring learning from generation to generation or from discipline to discipline
- Orfilia – toxicology – contamination – leeching of arsenic from soil
- Fiber work in FSL - consider methods of contamination avoidance
- Visited laboratories with all work on one bench
- Digital – manage information – relevance now the issue as with all other information
- Lack of underlying principles the issue
- Each new area considers the forensic issues as new to them



Paul Kirk

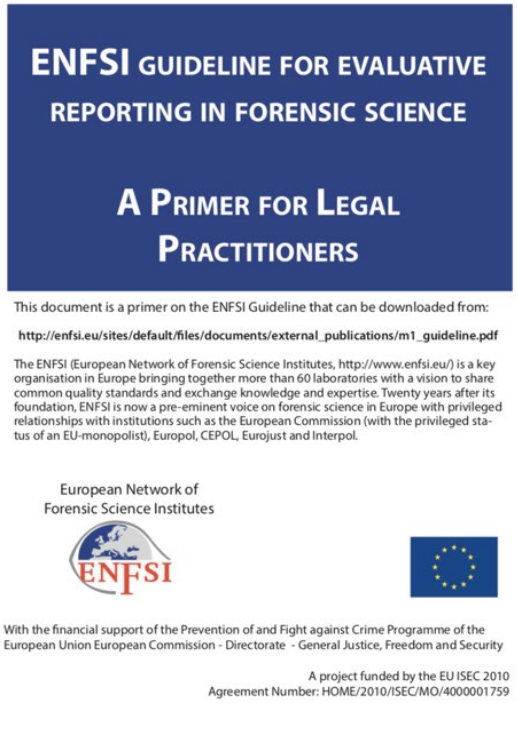
"Wherever he steps, whatever he touches, whatever he leaves, even unconsciously, will serve as a silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects. All of these and more, bear mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent. Only its interpretation can err. Only human failure to find it, study and understand it, can diminish its value." (8) So the physical objects preserved and the microscopic images or analytical maps of real physical evidence recorded are the heart and soul of forensic science, because they, themselves, do not lie.



"There exists in the field of criminalistics, a serious deficiency in basic theory and principles , as contrasted with a large assortment of effective technical procedures."
The ontogeny of criminalistics by Paul Kirk 1963


Mis
Information

Cook, R., Evett, I. W., Jackson, G., Jones, P. J. and Lambert, J. A. 'A model for case assessment and interpretation', *Science and Justice,* 38(3), pp. 151-156. Standards for the formulation of evaluative forensic science expert opinion ; Science and Justice 49 (2009) 161–164



Based on Case assessment and Interpretation
Standards Association of Forensic Science Providers

What to Expect

Case Assessment & Interpretation

- Fixed situations where two items questioned and known are tested for comparison
- If any transfer is involved, need information over and above the physical or chemical properties of the items in question – need information on how likely are they to transfer and be detected to populate the numerator and how many other people in the population (however that population is defined) are likely to have such material to populate the denominator – activity information
- Smears in traffic accidents
- Multiple fragments in glass
- Types that shed in fibers
- DNA findings led?
- Changing – increasing number of reviews on transfer issues

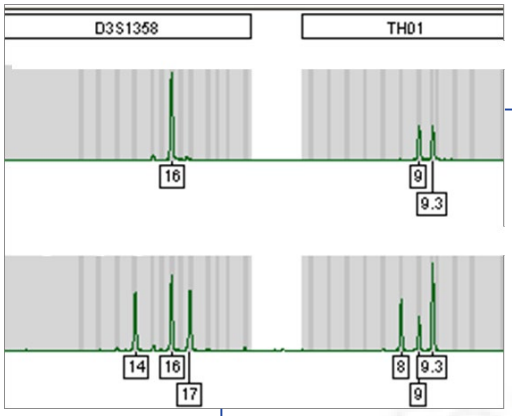
van Oorschot, R. A. H., Szkuta, B., Meakin, G. E., Kokshoorn, B. and Goray, M. (2018) 'DNA transfer in forensic science: a review', *Forensic Science International: Genetics* 38 (2019) 140–166

.

.

Practical example from my work this year

- DNA - the holy grail
- So successful that it is pushed to the absolute limit –
- Consistent narrative ignored
- If measurement is taken out of context or becomes the total focus, we risk having a different type of problem
- Are we satisfied that a genotype taken from a complex mixture in a one off situation with no option of retesting is suited to the criminal justice system?
- The reality today is that the total focus on how we get a number from such a situation may completely miss the uncertainty issues which in turn have the potential to undermine the LR at source or sub-source level



Extensive blood stains
DNA profile matching victim

Mixed profile
Some association with POI

Information that hammer used in attack

Is it reasonable to suggest that we cannot have the same confidence in DNA from each situation?
Should we consider alternative propositions?

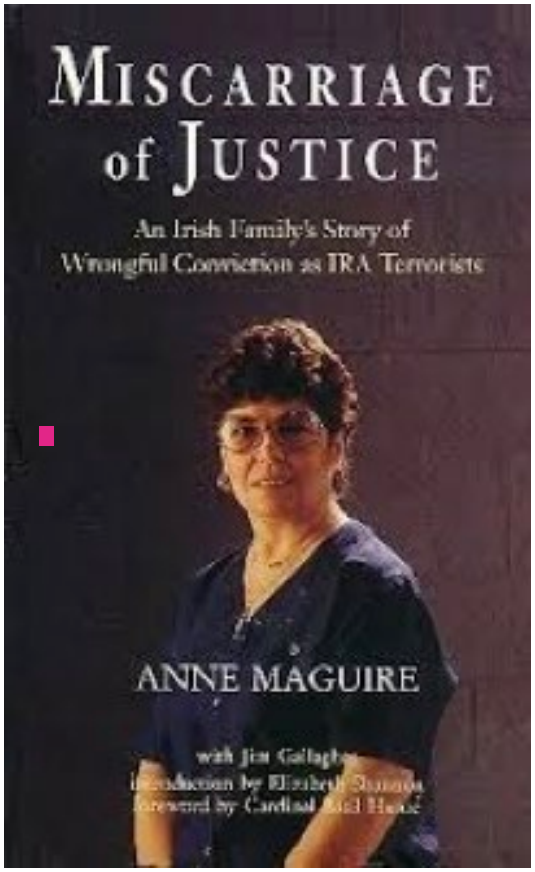
Aim for simplicity

- Locard “every contact leaves a trace” defines forensic science and is used outside the field.
- The actual translation from Locard “*The truth is that none can act with the intensity induced by criminal activities without leaving multiple traces of his path---*” gives us more insight. It has been explained (Roux et al., 2015) to be composed of three parts
- “Nature of the criminal activity influences the types of material that are exchanged, and how they are dispersed in the environment
- These materials, remnants of the activity, are the traces that become signs when detected, recognized, collected and measured
- The interpretation process aims at transforming them into clues in order to reconstruct what occurred”

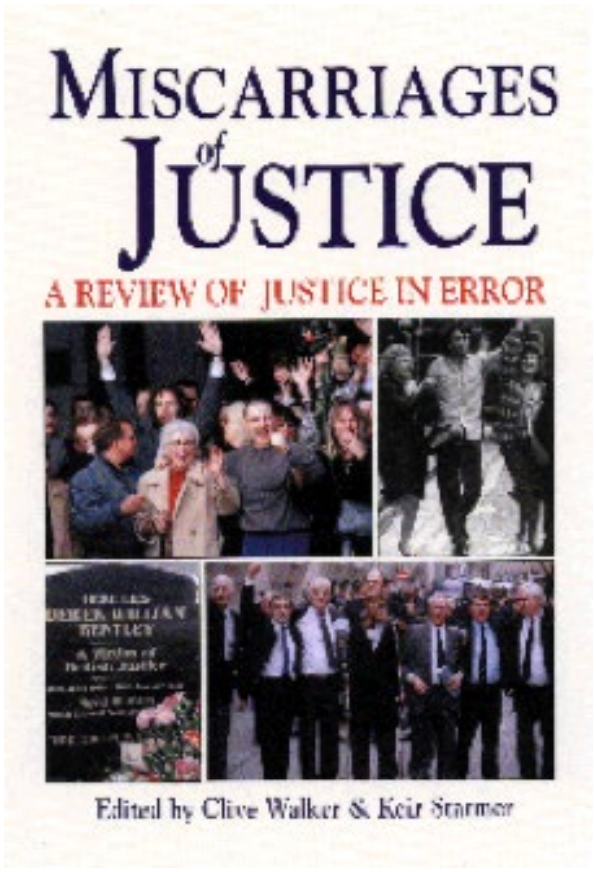
The implication of this is that more thought is needed about what to expect in given situations which is what we undertake when considering activity propositions

Also need to be conscious of what’s missing

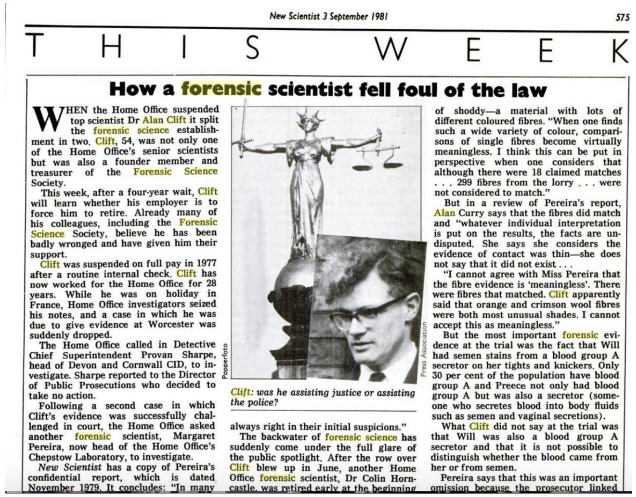
FORENSICS@NIST #NISTforensics



FORENSICS@NIST #NISTForensics



R. v. Anne Maguire, Patrick Joseph Maguire, William John Smyth, Vincent Maguire, Patrick Joseph Paul Maguire, Patrick O'Neill and Patrick Conlon (1991) 94 Crim. App. R. 13



New Scientist 3 September 1981 575

THIS WEEK

How a forensic scientist fell foul of the law

WHEN the Home Office suspended top scientist Dr Alan Clift it split the forensic science establishment in two. Clift, 54, was not only one of the Home Office's senior scientists but was also a founder member and treasurer of the Forensic Science Society.

This week, after a four-year wait, Clift will learn whether his employer is to force him to retire. Already many of his colleagues, including the Forensic Science Society, believe he has been badly wronged and have given him their support.

Clift was suspended on full pay in 1977 after a routine internal check. Clift has now worked for the Home Office for 28 years. While he was on holiday in France, Home Office investigators seized his notes, and a case in which he was due to give evidence at Worcester was suddenly dropped.

The Home Office called in Detective Chief Superintendent Provan Sharpe, head of Devon and Cornwall CID, to investigate. Sharpe reported to the Director of Public Prosecutions who decided to take no action.

Following a second case in which Clift's evidence was successfully challenged in court, the Home Office asked another forensic scientist, Margaret Pereira, now head of the Home Office's Chepstow Laboratory, to investigate.

New Scientist has a copy of Pereira's confidential report, which is dated November 1979. It concludes: "In many

Clift: was he assisting justice or assisting the police?

always right in their initial suspicions."

The backwater of forensic science has suddenly come under the full glare of the public spotlight. After the row over Clift blew up in June, another Home Office forensic scientist, Dr Colin Hornecastle, was retired early at the beginning

of shoddy—a material with lots of different coloured fibres. "When one finds such a wide variety of colour, comparisons of single fibres become virtually meaningless. I think this can be put in perspective when one considers that although there were 18 claimed matches . . . 299 fibres from the lorry . . . were not considered to match."

But in a review of Pereira's report, Alan Curry says that the fibres did match and "whatever individual interpretation is put on the results, the facts are undisputed. She says she considers the evidence of contact was thin—she does not say that it did not exist . . .

"I cannot agree with Miss Pereira that the fibre evidence is 'meaningless'. There were fibres that matched. Clift apparently said that orange and crimson wool fibres were both most unusual shades. I cannot accept this as meaningless."

But the most important forensic evidence at the trial was the fact that Will had semen stains from a blood group A secretor on her tights and knickers. Only 30 per cent of the population have blood group A and Preece not only had blood group A but was also a secretor (someone who secretes blood into body fluids such as semen and vaginal secretions).

What Clift did not say at the trial was that Will was also a blood group A secretor and that it is not possible to distinguish whether the blood came from her or from semen.

Pereira says that this was an important omission because the prosecutor linked

Review -"*In many ways Dr Clift's attitudes reflect those of the very early forensic scientists who saw their function as one of 'helping the police' and not as I believe a modern forensic scientist would see it (a) to assist police in their investigations and (b) to assist in the cause of justice in the courts.* "Mick Hamer, 'How a forensic scientist fell foul of the law', *New Scientist*, 3 September 1981, pp. 575–6.

'A' secretor status
Mixed stain – victim and suspect
Reaction only to be expected if from semen
Disagree - colleagues
Never asked – not disclosed

What to disclose

Type of reports	Technical reports	Investigative reports	Evaluative reports	Intelligence reports
Characteristic	Factual	Explanations	Comparisons	Linking series
Use	Often legal definition	Leads during investigation or explanations for findings	Comparing questioned and known samples or evaluate findings in light of competing propositions	Collating findings to provide data for evidence based policing
Examples	Level of active ingredient in a white powder; Level of alcohol	Explanation for blood pattern at a scene; " observations made on the cartridge case suggest that it has been fired by an ASTRA 9mm pistol."	Comparison of DNA profiles; Glass fragments; Kicking versus walk by;	Patterns of fingerprints or footprints at scenes linked with various types of other findings – DNA, Partial marks
Tools/mechanism	Error rates, SD	Narrative	Likelihood ratio at source or activity	Computer programs

Lessons learned from a ’Life in Crime’

1. Forensic science as a discipline is not recognized partly because it is not well defined and means different things to different people and therefore progress is difficult
2. The lack of a common language works against progress, as does an agreed shared understanding of a common knowledge base
3. A lack of articulation and acceptance of principles prevents learning transferring from one generation to the next and from one discipline to another
4. There is not enough emphasis on the scene and how to communicate to the court
5. Accreditation is a valuable management tool but needs to be seen as continuous improvement and not used to stifle scientific curiosity
6. Education is key to progress and a strong code of ethics is needed across the field of forensic science
7. Leadership needed in the field – lot of noise from the outside
8. Blind acceptance or complete rejection of test methods is not helpful when the contribution is dependent on the question asked
9. Paradoxically the demand for more service is reducing the contribution from the service – more test results not always more answers
10. Need a system where science supports justice

Thank you very much for your attention