Maintaining the Ecosystems of Niche Forensics

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Me

- CSI/CSM 2001-2007
- Forensic Archaeologist/Ecology Coordinator 2007-2021
- Lecturer/Reader in Forensic Investigation/Forensic Archaeology 2009-2021
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- In ecological terms, Niche forensic disciplines are highly adapted apex disciplines.
  - They are expensive, because they rely on experienced labour and cannot be automated as processes.
  - Their application is determined by careful engagement with forensic and investigative strategies, demanding a broad skillset from the Niche Reporter.
  - To continue the ecological comparison – niche disciplines have very high carrying capacity demands.
- Niche forensic disciplines are highly vulnerable to degradation and extinction.
- Niche disciplines cannot be readily reintroduced into the wild of the marketplace.
- Recent developments in forensic investigation and science have challenged pre-existing models of provision in ways feared but not closely modelled.

8 things to talk about

1. What makes a niche discipline niche?
2. Is this a science thing?
3. How do we think about knowledge in a forensic context?
4. How do we think about forensic strategies? How are they constructed?
5. Where do niche practitioners come from?
6. How might we build systems that allow sustained development of forensic practice?
7. Can technology, automation and scientific research help?
8. Does any of this matter?

1 What makes a niche discipline niche?

- Niche (capital N) is a proprietary name for a crime recording system with a forensic module – I'm not talking about this.
- Niche (capital N) is a section within some police force contracts for the fulfillment of forensic requirements
- niche (no capital) is a descriptor for seldom-used forensic disciplines – this is what I'm talking about.
  - There is a big overlay between the second and third definitions.
  - The third definition has no clear parameters, but could be as broad as any forensic discipline that sits outside of core bio/chem/drugs/tox/fire/digital provision.

1 What makes a niche discipline niche?

- Niche forensic disciplines (for the most part) sit outside of the structures of large FSPs:
  - Recruitment
  - Training
  - Laboratory arrangements
  - SOPs
  - Quality
    - This challenges the current systems of scrutiny, accreditation and regulation in forensic science.
- Niche forensic disciplines tend to be dominated by areas where scientists and practitioners are drawn from outside core forensics:
  - They are often trained in a parent discipline and later develop forensic applications.
  - They may lack the context of major crime investigation that other forensic practitioners take for granted.
- Niche disciplines focus their applications on major crime.
- Niche disciplines have tended to be very popular additions to forensic science degrees.
  - This can create an imbalance in training and student/practitioner populations.

1 What makes a niche discipline niche?

- An indicative list of niche disciplines:
  - Archaeology
  - Geophysical search
  - Anthropology
  - Botany
  - Palynology
  - Entomology
  - Soils/Geology
  - Carbon Dating
  - Diatoms Analysis
  - UAV / scene survey / 3D scene visualization
  - Isotope analysis
  - Paediatric pathology
  - Clothing analysis
  - Stomach contents analysis
  - Specialist toxicology

2 Is this a science thing?

- Harrison, K. 2006. ‘Is Crime Scene Examination science, and does it matter anyway?’

- *Science & Justice,46, 65-68*

Scientific and technical

Is Crime Scene Examination science, and does it matter anyway?

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Science & Justice 2006 46 65 – 68 Received 21 March 2005 accepted 13 March 2006

This short piece aims to assess the kind of data collected by Crime Scene Examiners (CSEs), and to discuss whether this collection constitutes a scientific process. It also seeks to examine the balance of roles performed by the CSE, between data gatherer and investigator. The piece also aims to conclude on whether a clearer understanding of the structure of data collected by CSEs might be of some practical use in developing a greater understanding of the architecture of knowledge that forensic science as a whole relies upon.
As a piece of work it is unapologetically theoretical in its perspective, and seeks to prompt further discussion regarding the structure of scientific knowledge, and any relevance this might have to its application in a forensic context. Ultimately, it seeks the inclusion of the processes of data gathering performed largely by CSEs within the wider processes of forensic science.

Este breve trabajo intenta valorar el tipo de datos que recogen los examinadores de la escena del crimen (CSEs) y discutir si esta recogida constituye un proceso científico. También trata de ver el compromiso de tareas llevadas a cabo por los examinadores, entre recogida de datos e investigación. Este trabajo además intenta concluir en si una mayor clarificación de la estructura de los datos recolectados por los CSEs puede ser de uso práctico en el desarrollo de un mayor entendimiento de la arquitectura del conocimiento en que la ciencia forense se apoya como un todo.
Como trabajo, no es apologéticamente teórico en su perspectiva y busca promover discusiones de manera inmediata en relación con la estructura del conocimiento científico y cualquier relevancia que esta pueda tener como aplicación en un contexto forense. Finalmente, lo que busca es la inclusión del proceso de la recogida de datos, llevada a cabo en su mayoría por CSEs, dentro del más amplio campo de la ciencia forense.

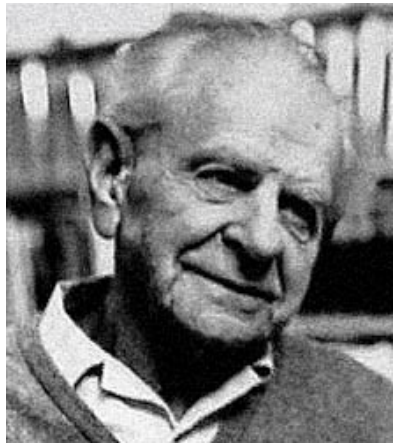
Der vorliegende kurze Artikel zielt auf die Bewertung der Art der von den Tatortermittlern erhobenen Daten und die Erörterung der Frage ab, ob diese Art der Datenerhebung ein wissenschaftliches Verfahren darstellt. Ferner geht es darin um die Untersuchung des Gleichgewichts zwischen den Rollen der Tatortermittler, d.h. zwischen den Datensammlern und den Ermittlern. Des Weiteren zielt der Text auf die Schlussfolgerung hinsichtlich der Frage ab, ob ein klareres Verständnis der Struktur der von den Tatortermittlern erhobenen Daten bei der Entwicklung eines umfassenderen Verständnisses der Architektur des Wissens, auf der die Kriminaltechnik als Ganzes beruht, in irgendeiner Weise von praktischem Nutzen sein könnte.
Als Arbeit ist er unentschuldbar theoretisch in seiner Perspektive und versucht, weitere Diskussionen hinsichtlich der Struktur wissenschaftlicher Erkenntnisse und der Bedeutung, die diese für die Anwendung in einem kriminaltechnischen Kontext haben könnte, herbei zu führen. Schließlich ist der Text um die Einbeziehung der Prozesse der größtenteils von Tatortermittlern durchgeführten Datenerhebung in die umfassenderen Prozesse der Kriminaltechnik bemüht.

Ce petit article vise à déterminer le type de données récolté par les techniciens de scène de crime et de discuter si cette collection constitue un processus scientifique. Il observe également l'équilibre des rôles de ces techniciens, entre collecteurs de données et investigateurs. Cet article vise également à conclure si une compréhension plus claire de la structure des données récoltées par les techniciens de scène de crime peut être d'une utilité pratique pour développer une compréhension plus grande de la structure de la connaissance sur laquelle les sciences forensiques se basent.
Ce travail est théorique dans sa perspective et cherche à provoquer la discussion en ce qui concerne la structure de la connaissance scientifique, et toute pertinence qu'elle pourrait avoir à l'application dans un contexte forensique. Le but ultime est d'inclure ces processus de recherche de données, produit principalement par ces techniciens de scène de crime à l'intérieur des processus plus larges des sciences forensiques.

2 Is this a science thing?

- Fundamentally no – forensic science is a crossroads of application, it is not a science *per se*.
  - It has no unified means of deriving knowledge.
  - Different forms of forensic science fit the hypothetico-deductive model with different degrees of comfort and fidelity (or not at all).
  - Some forensic sciences are easily quantifiable – others are not.
- There is no easy distinction between the evidential end of a police investigation, and the investigative end of a CSI examination.
- Forensic science is a set of applications, like medical sciences.
- Forensics more generally is a set of rigourous investigative processes with a grounding in empirical observation and measurement and a need to satisfy the requirements of the court.

The Scientific Process?

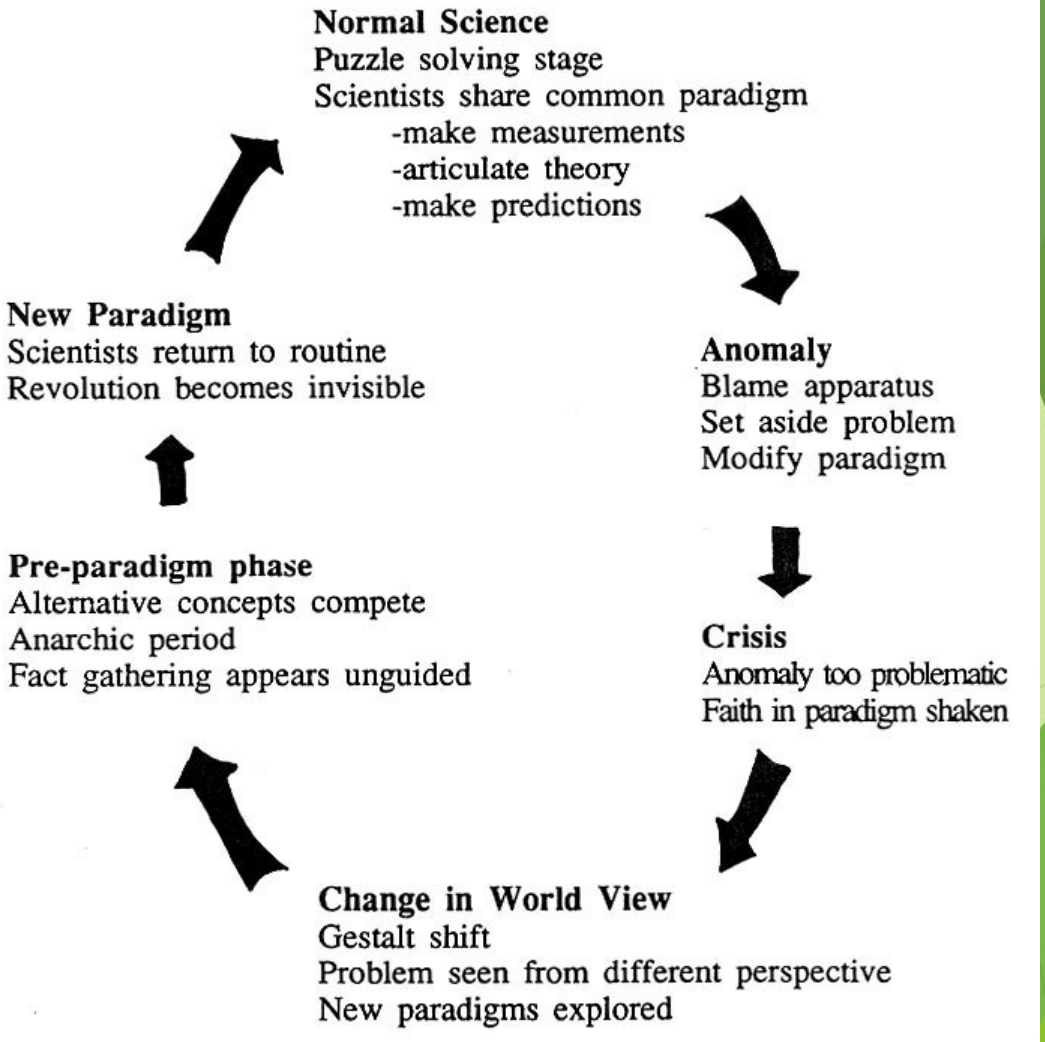


Popper (1963)
Conjectures & Refutations

https://discover.hubpages.com/education/Hypothetico-Deductive-Method-in-Business-Research

The Kuhn Cycle

Kuhn (1962) The structure of scientific revolutions

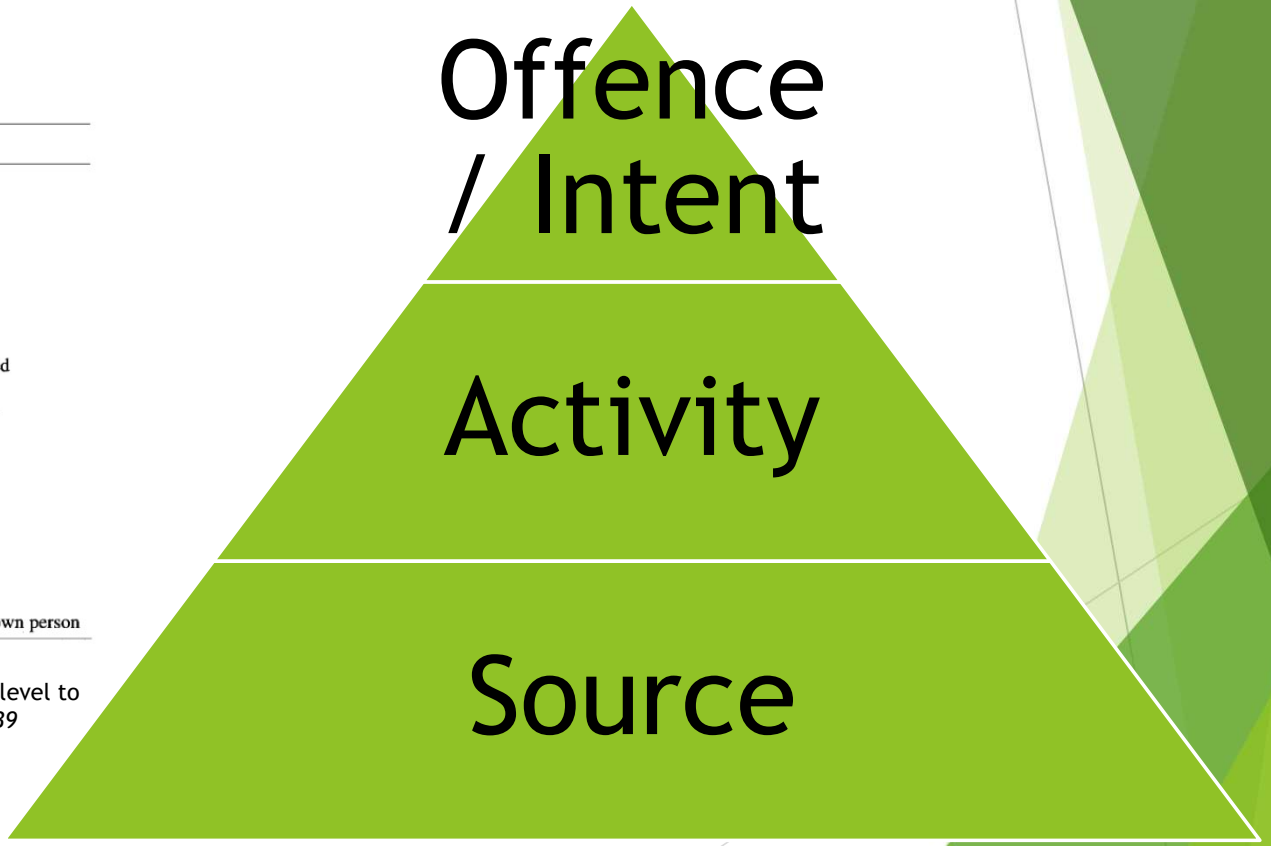


3 How do we think about knowledge in a forensic context?

TABLE 1 Examples of the hierarchy of propositions.

Level	*Generic*		*Examples*
III	Offence	A	Mr A committed the burglary
			Another person committed the burglary
		B	Mr B raped Ms Y
			Some other man raped Ms Y
		C	Mr C assaulted Mr Z
			Mr C had nothing to do with the assault of Mr Z
II	Activity	A	Mr A is the man who smashed window X
			Mr A was not present when window X was smashed
		B	Mr B had sexual intercourse with Ms Y
			Some other man had sexual intercourse with Ms Y
		C	Mr C is the man who kicked Mr Z in the head
			Mr C was not present at the kicking of Mr Z
I	Source	A	The glass fragments came from window X
			They came from some other broken glass object
		B	The semen came from Mr B
			The semen came from some other man
		C	The blood on Mr C's clothing came from Mr Z
			The blood on Mr C's clothing came from an unknown person

Cook et al (1998) A hierarchy of propositions: deciding which level to address casework. *Science & Justice 1998; 38(4): 231-239*



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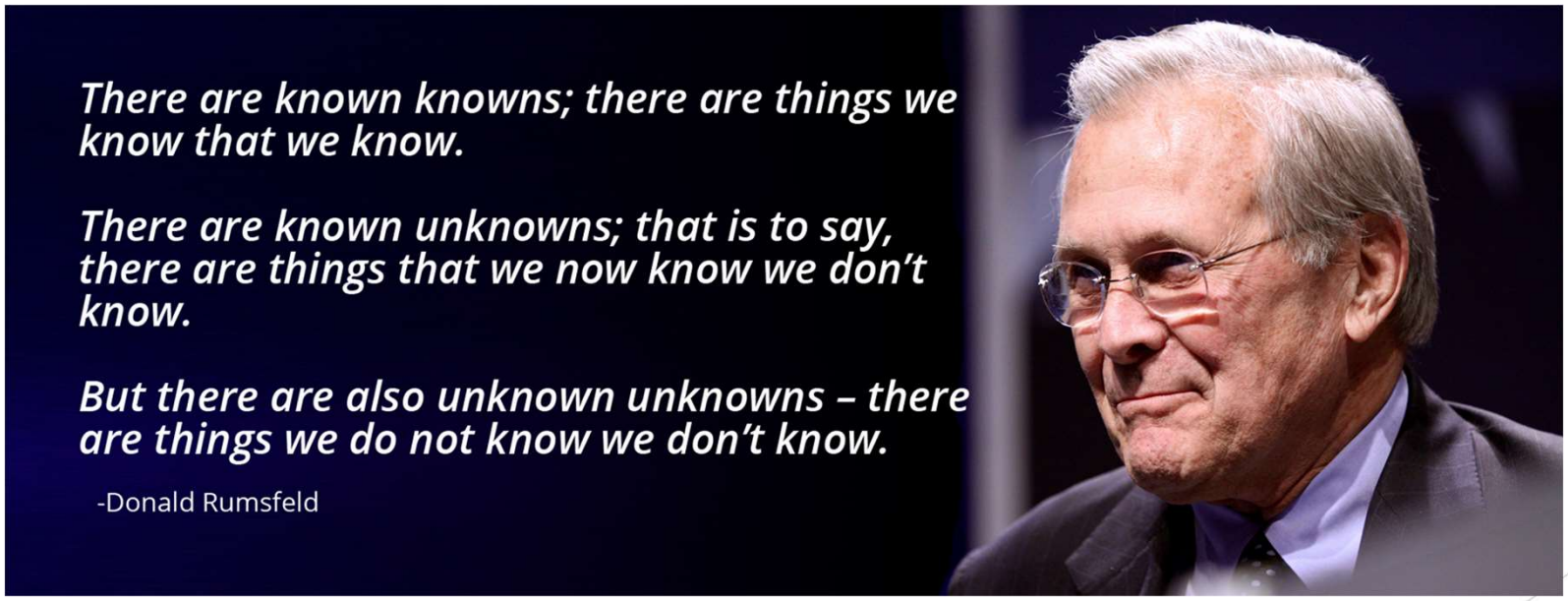

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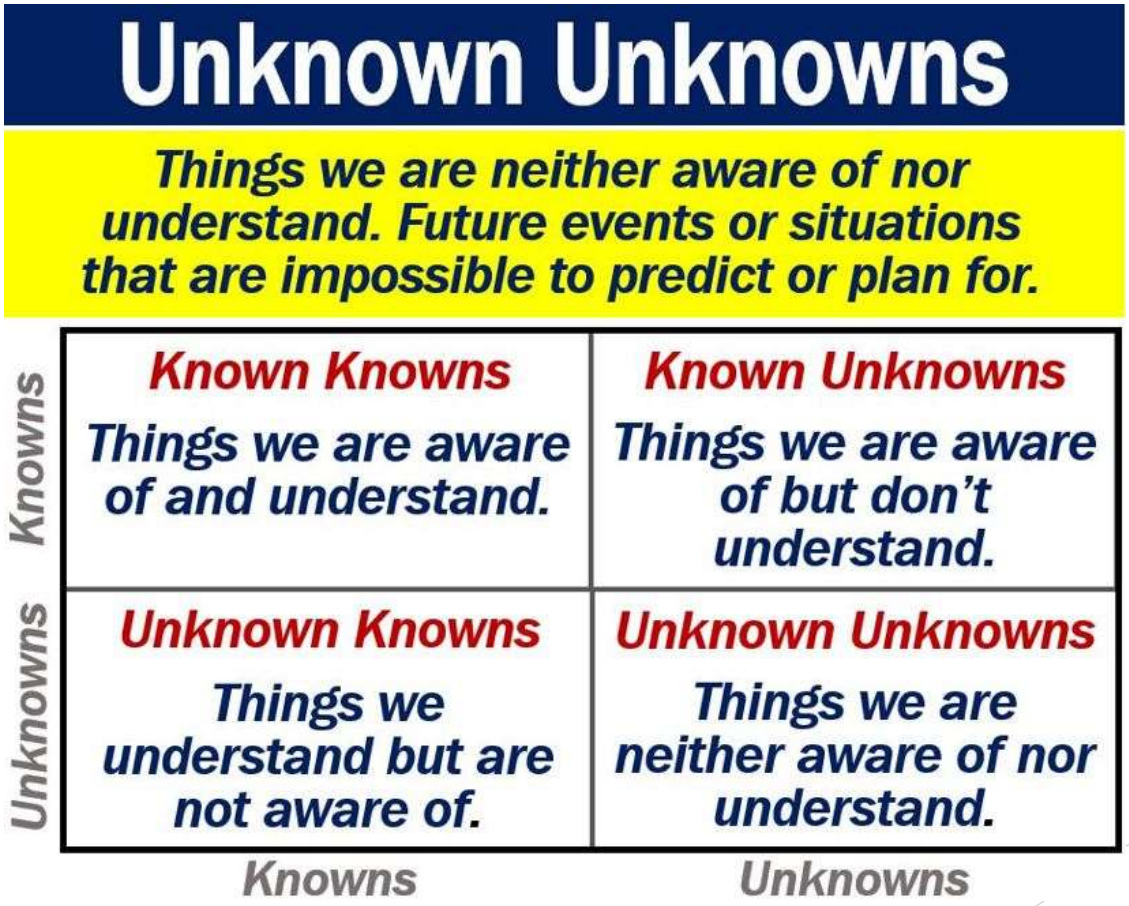


3 How do we think about knowledge in a forensic context?

- Do you have sufficient information to conduct your examination?

- What information do you know? – *known knowns*
  - **Test and challenge against new known knowns (networked intelligence).**

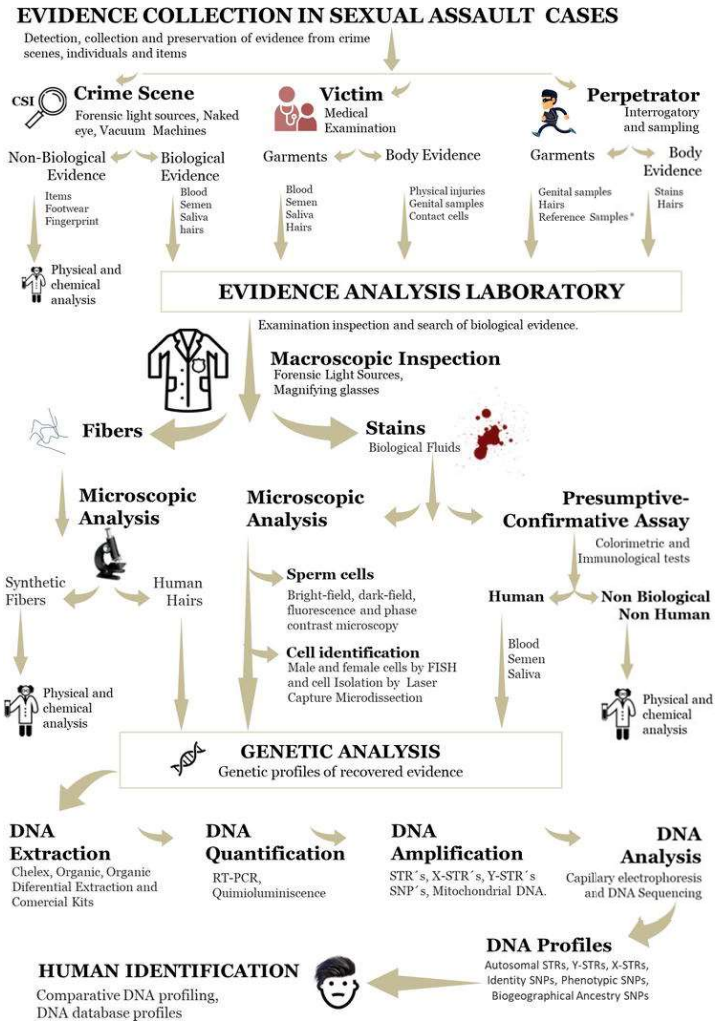
- What information do you know is currently absent? *unknown knowns*
  - **Prioritise within forensic strategy.**

- What information is present but makes no sense? – *known unknowns*
  - **Consider specialist assistance**

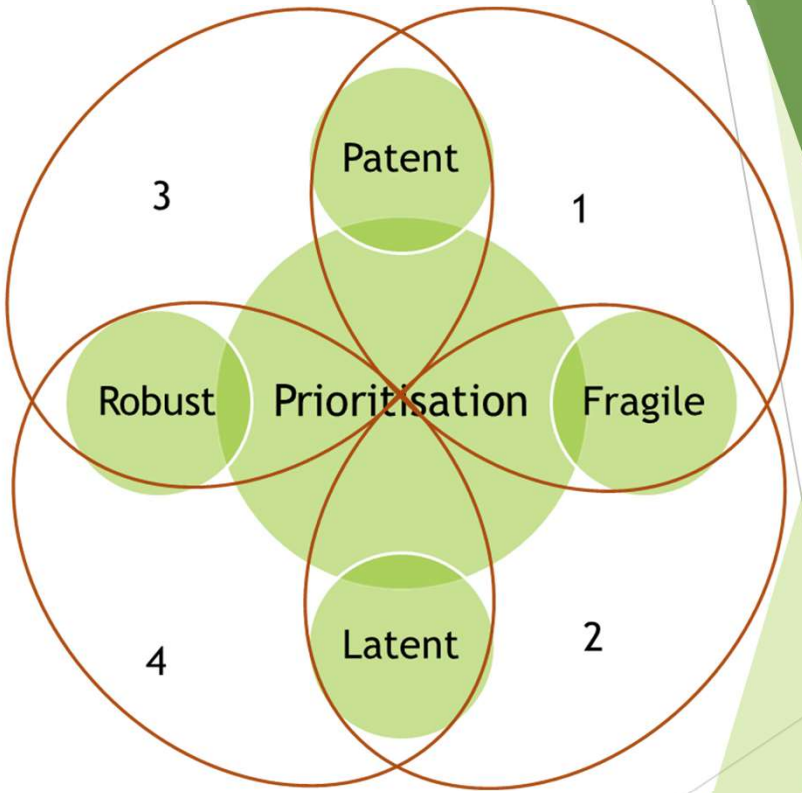
- What does that leave? – *unknown unknowns*
  - **Be open to what the scene has to offer!**

4 How do we think about forensic strategies? How are they constructed?

- Major crime investigation is controlled and supported by a framework of written strategies.

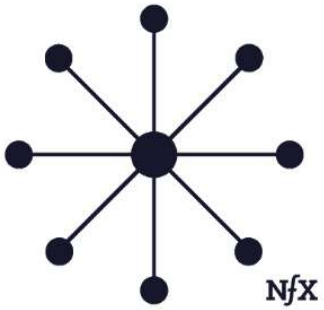


Ramos, 2019 Biological Evidence Analysis in cases of sexual assault



Harrison, 2021

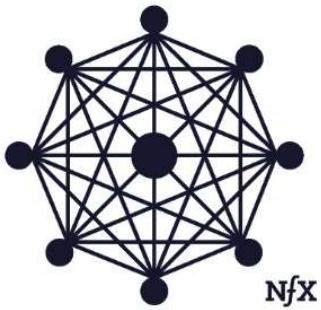
Sarnoff's Law



$V=n$

The value of the network (V) increases in direct proportion to the size of the network (n).

Metcalfe's Law



$V=n^2$

The value of the network increases to the square of the number of users in the network.

Do your forensic activities function independently, or are they interconnected in their effect?

Rudolph Tegner, *Birth of Athena*

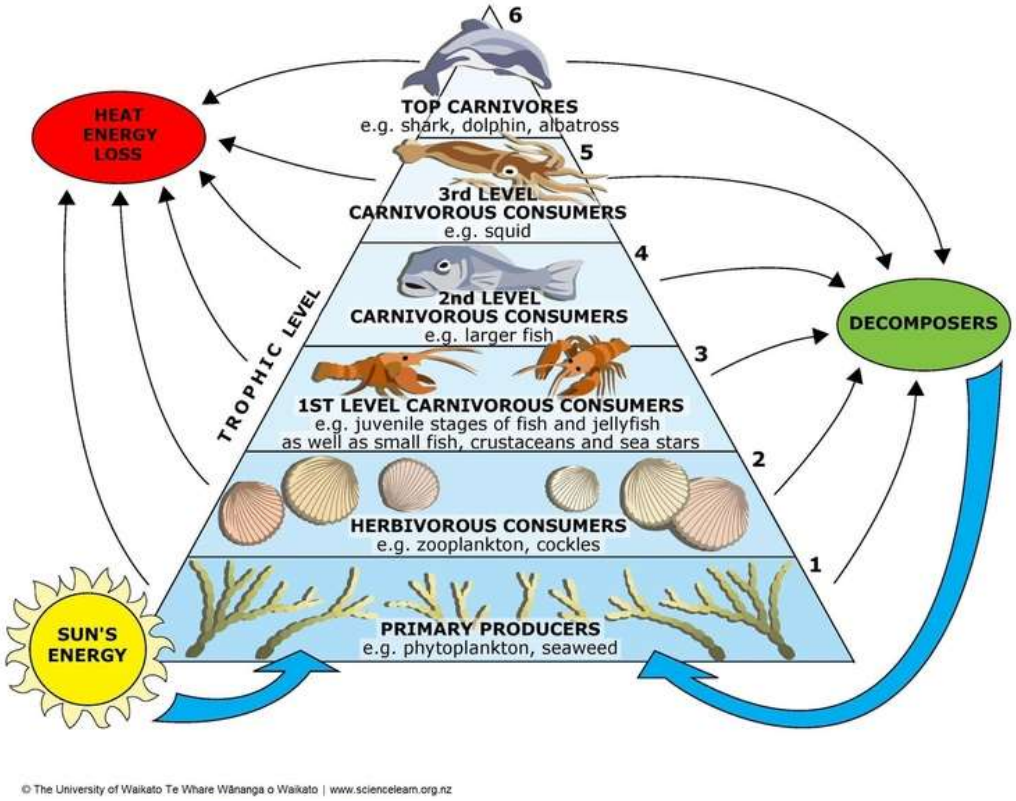
5 Where do niche practitioners come from?

5 Where do niche practitioners come from?

- A very personal path…
  - Graduate background in parent discipline, with field skills.
  - Postgraduate qualification in a ‘facilitating’ masters.
  - Entry-level professional training in CSI.
  - Research portfolio that unites traditional discipline and forensic applications.
  - Development to CSM; production and management of forensic strategies.
  - Move to large FSP as a reporting scientist in forensic aspect of parent discipline.
  - Broaden training & awareness across forensic disciplines; understand role of reporting scientist in complex & major strategies.
  - Move to university to teach & research.
  - Establish specialist forensic provider.
  - Move to national strategic role.

- Started BA degree 1994 … left large FSP as consultant reporting scientist 2009.

6 How might we build systems that allow sustained development of forensic practice?



6 How might we build systems that allow sustained development of forensic practice?

- Niche disciplines – and niche practitioners – sit at the end of a complex system.
- The system is dependent on a market, but its fate would be the same in a publicly-held context.
- The market depends upon bulk volume crime for its survival (‘Primary Producers’ in the ecological model).
- Niche practitioners require a ladder of development to allow them to reach the ends of this system with requisite experience and abilities.

6 How might we build systems that allow sustained development of forensic practice?

- Excessive attendance criteria at volume crime scenes limits access to primary producers.
- Limited primary producer access denudes junior examiners of their normative judgement development.
- Limited primary produced access restricts skill development and lengthens apprenticeship times.
- Lengthy apprenticeship times lower professional retention times of junior practitioners, increasing staff turnover and pressure on training.
- Highly experienced forensic decision makers (CSMs & forensic practitioners) become an ageing and dwindling resource.
- Formalised process cannot replace actual experience.

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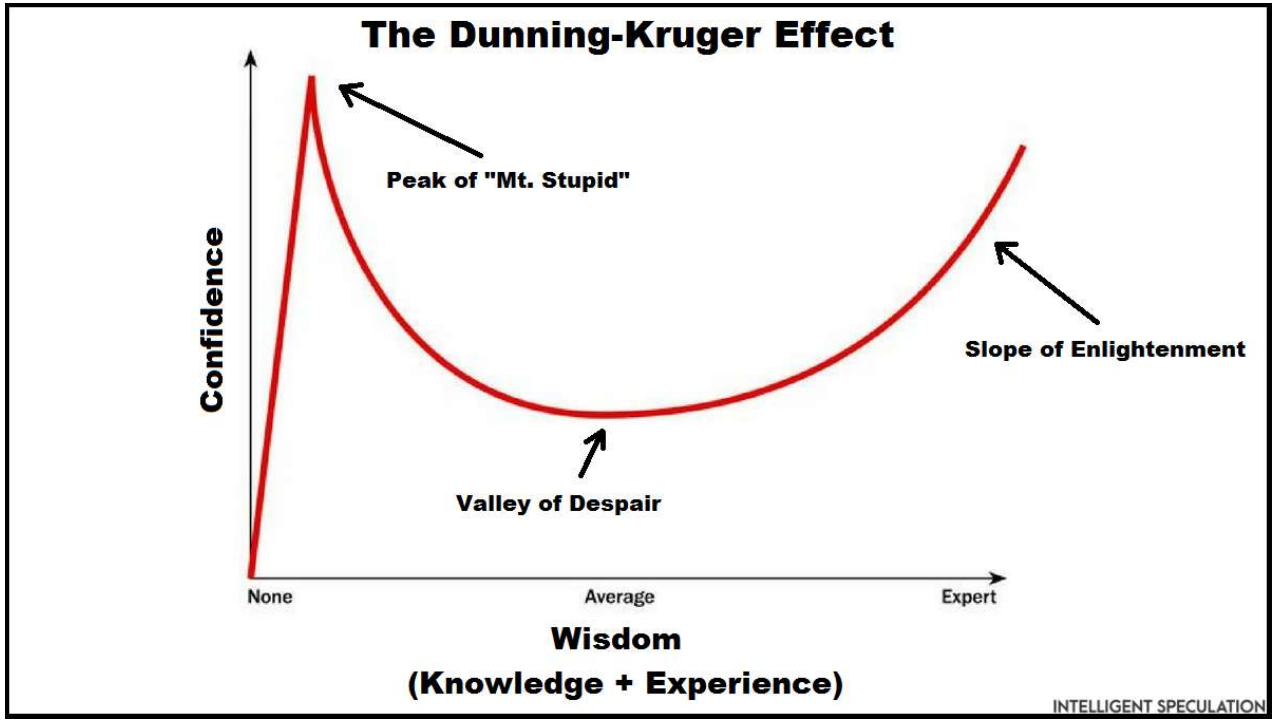

7 Can technology, automation and scientific research help?

- Research is essential for the ongoing development of forensic practice.
  - It should continue to improve practice.
  - It should involve and empower forensic professionals, rather than be conducted in isolation.
  - Investigative need should be a key driver for research.
  - As a crossroads discipline of application, fundamental research can and should be derived from parent disciplines.
  - Forensic practice must be broad enough to facilitate robust research in areas that are poor fits for the hypothetico-deductive model.
- Automation can facilitate practice, but it can't replace the experienced practitioner as a decision maker within the investigative process.
  - This is fundamentally because of society (Kuhn), rather than the scientific parameters (Popper).

8 Does any of this matter?

- Casually constructed models of scientific development present a ‘whig history’ illusion of ongoing improvement driven by inevitable scientific progress.
- This ecological model of forensic science presents an alternative:
  - Judgement and experience are the key drivers of professional development.
  - There is a direct link between the fundamental skills and judgement developed at low levels of response, and the most complex and major investigations.
  - A complex interconnected system like the one presented can be subject to the law of unexpected consequences.
  - A failure to maintain a sustainable ecosystem will prompt extinctions that will begin with apex practitioners – their loss should be seen as a bellwether.
  - The formalised processes developed in efforts to meet quality standards are important, but they cannot substitute the development of judgment at any level, and any attempt to use them as such at the highest levels will result in spectacular failure.

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Thank you for listening

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