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A Curious Reconstruction? The Shaping of 'Marketized' Forensic Science

Chris Lawless

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Abstract

The integration of science into policing functions continues to be a subject of considerable official concern. Sociological study of forensic science has demonstrated great promise in illuminating the dynamics of the law-science relationship, but has yet to be fully extended to issues relating to policing. This paper seeks to address the importance of extending research activity in this area by addressing the effects of broader political and economic trends on the development of forensic science and its use in criminal investigations. It focuses on the influence of 'liberalizing' policies on policing functions, which have extended to the provision of scientific support to the police. Forensic scientific services in England and Wales are now procured via a market-led system, and an economic imperative can be seen to have permeated strongly into this domain. With recourse to examples of a series of initiatives, I show how the application of liberalizing processes has permeated into the science-police relationship in various ways, leading to the emergence of assemblages which serve to differentially reconstruct the relationship between forensic scientists and their chief 'customers', the police. I argue that these differences in reconstruction reflect ongoing tensions between two different interpretations of scientific integration – one which is science-led and another which is police-led. Drawing upon these examples, I demonstrate how these tensions manifest themselves, but also show how these two interpretations co-exist. I show how an exploration of these initiatives aids understanding of how science, policing, and liberal modes of governance co-evolve.

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Introduction

The incorporation of science into the criminal justice system continues to be a key preoccupation of official discourses. Such concerns have ranged from the effectiveness by which police use the products of forensic science (ACPO/FSS/Audit Commission 1996, HMIC 2002), the timeliness of the provision of scientific services to the police (NAO 1998), how to measure the contribution forensic science makes to police performance (McCulloch and Tilley 2000; Burrow et al 2005), to more strategic concerns about the most effective means to organize the reconciliation of science and technology with policing (Home Office, 2003, 2009), as well as the issue of ultimately determining the admissibility of expert evidence (Law Commission 2009). Such concerns are also prevalent within and between other jurisdictions (NAS 2009, Wilson 2009). Even this list, which is far from exhaustive, demonstrates the magnitude of the problem space, and the significance accorded to the relationship between science and criminal justice. Attempts to address these issues are problematized further, however, by the high degree of heterogeneity apparent within the landscape of forensic science. This landscape consists of a plethora of knowledges, practices, artefacts and interactions, which, together with the varying contribution forensic science makes to policing, resists simple academic comprehension (Fraser and Williams 2009).

A growing number of Science and Technology Studies (STS) researchers have drawn attention to the complexities of shaping scientific knowledge in the service of the law, particularly in the context of the courtroom (Jasanoff 1998, Cole 1998, Lynch and McNally 2003, Lynch 2004). As insightful as such studies undoubtedly are, there remains a pressing need for STS scholarship to continue to address the integration of science at other stages of the criminal justice system. Research has tended to focus on more localized instances of the construction of 'forensic' knowledge, and there have been very few attempts to reconcile the insights of these studies with the broader institutional contexts which frame the activities of law enforcement actors. A failure to do so means that STS scholarship in this area is limited to providing only a brief series of snapshots of a complex area. Such approaches, while enabling a fine-grained assessment of the social dynamics of the construction of forensic scientific knowledge, are highly constrained in terms of their spatial and temporal reach. While some studies have sought to assess the development of specific forensic technologies from broader historical perspectives (Cole 2001, Aronson 2007, Gerlach 2004), there exists a marked absence of understanding regarding the organizational influences which condition police expectations and uses of the products of forensic scientific activity in general (Williams 2007a: 766).

One important related issue concerns the apparent influence of the so-called 'New Public Management' (NPM). Numerous official reports, which have assessed the 'effectiveness and timeliness' of police appropriation of science, have constantly urged greater reshaping along NPM lines. Yet there has been little rigorous assessment of the possible effects of these currents, either on police uses of forensic science, or on the production of forensic scientific knowledge itself. Hence this paper seeks to address the question of the effect of liberalizing tendencies on both the professional relationship of

forensic scientists and police, and the kind of knowledge which is produced in the course of such interactions. In doing so, it seeks to critically address the question of how such policies are being appropriated in an important area of public life.

I seek to address this question by focusing on how these policies have influenced the co-evolution of the relationship between scientific and policing interests. Through the examination of a number of initiatives, including specific frameworks, guidelines and procedures, I chart how processes of scientific integration within policing are being shaped in different ways by the introduction of liberalizing reforms to police services. I argue that such initiatives embody different aspects of the role of modern liberal governance, leading to differing (re)-constructions of forensic 'experts' (or 'providers') and police investigators (or 'customers'). Through a closer study of these initiatives, however, it can be seen that tensions emerge which reflect a greater problematization of the relationship between science and policing.

This paper is based upon data obtained from the examination of a variety of texts, including official documents, academic journal articles, published statements by forensic practitioners, and websites. A number of semi-structured interviews with practitioners and other forensic science stakeholders, carried out between 2006 and 2010, also served to augment the study. In what follows I first outline the history of attempts to introduce a commercialized system of police scientific support. I then show how efforts to promote more 'scientific' behaviours among forensic scientists and their customers have been heavily dependent on the rise of probabilistic methods for evidential interpretation. With recourse to specific examples, I show how these have been appropriated for the purposes of forensic investigation in such a manner as to also reflect economic imperatives. In a subsequent section I then describe a series of developments which demonstrate the contending influence of police interests, but which also represent a response to liberalizing policies. Through these examples I show how the reconstruction of scientists and police in this latter mode produces certain points of tension regarding the professional and epistemic autonomy of forensic scientists and police. I conclude by briefly discussing how the issues raised in the paper point to a methodological orientation which invites further inquiry.

Creating the Market: The Evolution of Police Scientific Support Arrangements in England and Wales

At the heart of reforms to the provision of scientific support to policing in England and Wales is the introduction of the 'modernizing' economic rationality associated with 'New Public Management' (NPM). Variants of this approach to the organization and delivery of public goods and services have continued to influence all public sector domains over the last 25 years. This approach, described by Garland (2001: 190) as 'a ragbag of techniques, models, analogies and recipes for action that are loosely bound up by their appeal to economic rationality' has meant that police work – including that part of forensic scientific support provided by the public sector – has increasingly been

understood as simply one of the many 'markets in services, provision and expertise' (Dean 1999: 161) that make up modern public sector organizations in general.

The endorsement by the Audit Commission of NPM, with its ‘ethos of business management, monetary measurement and value-for-money government’ (Garland 2001: 116) has meant that all forms of police and police-related practice, including forensic science, have increasingly become subject to its developing discursive framework. The application of measures of ‘economy’, ‘efficiency’ and ‘effectiveness’ have been central to how various kinds of forensic support have been interrogated and shaped within the Police Forces of England and Wales (Home Office 1983). An early example of such influence can be seen in the report of the accountants commissioned by the Home Office to review the organization of scientific support in these forces (Touche Ross 1987). This report serves as a crucial historical document because its economic style of reasoning has provided a framework to which almost all subsequent studies have felt necessary to refer and, more often than not, endorse and adopt (Williams 2007a: 773).

Among the many issues considered in this report was the scope for changes in the method of funding and organization of the provision of forensic science to the police, who at the time were solely served by the Forensic Science Service (FSS). The report concluded that the police management of scientific support from both in-house laboratories, and from the FSS, was ‘generally poor’ (Touche Ross 1987: 3). It recommended the appointment of managers of scientific support in each force, employed by police forces, and responsible for the provision of all scientific services and the management of their own force forensic science budgets. This in itself represented a major step toward the growing devolution of budget responsibilities to operational law enforcement actors.

The Royal Commission on Criminal Justice, which reported to Parliament in July 1993, largely endorsed further reforms of police scientific support. While the Commission addressed a wide-ranging series of issues relating to criminal justice, it gave broad support to the further development of free market competition for forensic scientific services. However, in recognizing the considerable growth in the number and variety of private firms offering scientific support to both prosecution and defence, the Commission also raised concerns about how the quality of forensic science could be maintained (Roberts 1996: 39).

Even before the Royal Commission reported, the FSS had introduced a system of direct charging to forces and other clients (McFarland 2003). During the early half of the 1990s, other firms began to compete for business with the FSS, most notably LGC and Scientifics Ltd. Both of these providers had their origins in the public sector before becoming private suppliers of forensic science services. In 1996, Forensic Alliance, the first truly private sector forensic firm, entered the market. In the same year, the FSS replaced standard charging (per item submitted) with product-based charging. In the latter methodology each product, such as a body fluid search, tool mark examination or cannabis identification, was defined as encompassing a standard set of forensic

activities (Cook et al 1998a). Rather than providing a price for each test, the whole activity was costed to give a price more closely related to the actual work performed, ‘thus providing customers with a better understanding of the true costs of services and enabling them to make informed judgements about their value’ (NAO 1998: 30). Charging was seen as a key mechanism to control demand on the part of the police and to compel the traditionally internally focused laboratories to respond to the needs of their 'customers'.

As the pricing strategies of forensic service providers became more sophisticated, signs grew that forces were exploiting the new market conditions. In 2003, the government commissioned McFarland review assessed the management and business structures of the FSS in the light of increased competition for forensic science services (McFarland 2003). Forensic Science Providers (FSPs) were, at this time, offering volume discounts and loyalty schemes, which convinced the McFarland review that a ‘truly competitive market’ was ‘beginning to develop’ in UK forensics (McFarland 2003, Section 3.1). Furthermore, the review went on to argue that the introduction of ‘Best Value’ principles ‘had forced the police to seek better value for money in the bought-in services’ (McFarland 2003, Section 3.3), and that the police had become ‘informed customers’, with forces playing off suppliers against each other. Forces interviewed in the McFarland Review reported that they had begun to receive ‘a more personalized and responsive service’ from suppliers. This, McFarland argued, was a sign that competition had started to yield the ‘traditional benefits’ of greater choice, value for money and improved service delivery.

This period also saw increased scientific development in certain areas. Firms such as the FSS began to offer highly sophisticated technological services, particularly in areas such as DNA profiling. The expansion of products and services did, however, lead to Home Office concerns that the increased activity in the forensic science market meant that police forces and other customers were ‘not well placed to evaluate the quality of the service provided across the range of scientific disciplines’ (Home Office 2006: 2). Whereas the FSS, as the main state-run provider, had previously been regarded as the standards settings body, the subsequent pluralization of the market was seen to have created a ‘regulatory gap’ with no independent arbiter. In order to ensure quality standards in forensic science, the Home Office proposed the appointment of a Forensic Regulator, and in February 2008 Andrew Rennison became the first regulator to adopt the role on a permanent basis. Although the precise form of this regulatory regime continues to evolve, it has so far led to initiatives such as the National Forensic Framework Agreement (NFFA), which was finalized in August 2008. This has served to formalize the manner in which the various police forces in England and Wales enter into service agreements with commercial FSPs (NPIA 2010).

This brief overview has served to put into context the broader imperatives which have shaped the current environment in which forensic science services are now provided to, and procured by, police forces. In the midst of these developments, however, another series of concerns have emerged. These have largely originated among operational forensic scientists themselves, and reflect a growing awareness of the importance of

improving standards of scientific propriety. This has fed into a growing series of publicly voiced reflections concerning the precise role of the forensic scientist in criminal casework. Rather than acting as the mere provider of certain forms of evidence, there is growing opinion in some quarters that the 'essence' of forensic science can be re-framed in terms of 'the interpretation of those results in the individual context of each case' (Barclay & McCartney 2007). It has been argued that the potentially changing roles of forensic scientists reflect 'radical changes to police investigative technique', engendering a paradigm 'which places forensic scientists at the centre of an 'open' process of criminal investigation' (Barclay and McCartney 2007). Such arguments support the notion that investigative practice, as a whole, should embrace scientific rationality further, rather than continuing to adhere to institutionalized policing norms. These assertions promote a form of investigative reasoning which does not simply utilize the products of science and technology to provide evidence, but where criminal investigation becomes a form of scientific inquiry itself.

Probabilistic, risk-aware methods feature increasingly prominently in such deliberations, and these methods are viewed in some cases as constituting the epistemic heart of forensic inquiry itself (Evett and Joyce 2005). In what follows I describe the rise of these methods, and how these support a form of integration which privileges scientific interests, with ultimate implications for the relationship between forensic scientists and their primary 'customers', the police.

Science-Led Integration: The Rise of Probabilistic Reasoning in Forensics

I. Origins: Epistemic Risk and the Rise of a 'New Paradigm'

Much of the impetus for the promotion of probabilistic methods stems from a growing number of critical commentaries to be found in the sociological, legal, and forensic literature, which question the epistemological assumptions underpinning many areas of forensic science (Lynch 2003, Broeders 2006, 2007, Cole 2009). These criticisms centre on the alleged reliance on opaque, subjective means of interpreting evidence, and on certain questionable but enduring assumptions, such as the notion that evidence demonstrates categorical uniqueness (Williams 2007b). The tendency of examiners to draw categorical conclusions about evidential matches are regarded as dangerously simplistic, with the risk of contributing toward miscarriages of justice (Broeders 2006). In response, a 'new paradigm' has been advocated, which rejects these apparently fallacious and archaic assumptions (Saks and Koehler 2005). It promotes more sophisticated forms of evidential interpretation, based upon a conditional and explicitly quantitative orientation involving statistics and probability theory. Proponents of this latter approach argue that this 'new paradigm' positions forensic science more closely to generally accepted standards of scientific propriety, with positive implications both for the reliability of the conclusions drawn from forensic evidence, and for the epistemic standing of the discipline in relation to the so-called 'pure' sciences (Saks and Koehler 2005). Such a position has been endorsed in a recent report by The US

National Academy of Sciences (NAS 2009), which focused in part on ways to improve the reliability and validity of forensic scientific evidence within its jurisdiction (NAS 2009). It recommended that more work was needed toward the 'development of quantifiable measures of uncertainty in the conclusions of forensic analyses' (NAS 2009: S16-S17).

The roots of this 'new paradigm' can be partially traced via a series of academic deliberations in relation to law and forensic science. The use of probability theory in judicial decision making attracted particular interest through an array of influential articles published in US legal and forensic literature in the 1960s and early 1970s (Kingston 1965a, 1965b, Kaplan 1968, Finkelstein and Fairley 1970, Tribe 1971). Prominent discussion focused on the suitability of Bayes Theorem[1] as a means of evaluating evidence in order to overcome the risks of misusing statistics in courtroom deliberations, as exemplified in a series of controversial cases which occurred at the time. At around the same time as these debates were unfolding in legal circles, a similar discourse had begun to emerge in the separate, but related field of forensic science. A growing preoccupation with notions of scientific propriety increased interest in the application of mathematical techniques to the assessment of evidence. This reflected the assertion by Paul Kirk, a leading figure in forensic science (or 'criminalistics' as it was routinely known in the US), that his discipline was a 'science of individualization' (Kirk 1963: 236). Discussions of the possibilities of applying statistical methods to the interpretation of evidence reflect this interest in promoting a reflexive sense of scientificity. In 1964, a special session on statistics was held at a meeting of the American Academy of Forensic Sciences, which reflected the 'growing awareness of the usefulness of statistical methods' (Kingston 1965a: 79). In subsequent papers Kirk and his student Charles Kingston outlined the ways in which an advanced appreciation of probability theory could illuminate 'interpretive areas of criminalistics', with favourable consideration given to a Bayesian model (Kirk and Kingston 1964: 514; 1965a, 1965b).

These areas of activity, in both academic legal and scientific circles, further influenced the work of statisticians professionally engaged in forensic science. The work of Evett (1984, 1986, 1987) has played a particularly influential role in promoting and developing forensic applications of Bayes Theorem. While the use of Bayesian methods is not as yet universal, such approaches continue to be keenly discussed in forensic scientific circles. Indeed, many discussions about Bayesianism in forensic

[1] Bayes Theorem takes the general form:
Posterior Probability (Probability of a Hypothesis Given Evidence)
= (Prior Probability (Probability of Hypothesis) x Probability of Evidence Given The Hypothesis) /Probability of Evidence

Or, in mathematical terms:

$$P(H|E) = \frac{P(H) \times P(E|H)}{P(E)}$$

science resonate with a certain sense of fundamentalism tinged with evangelical fervour:

> That framework—call it Bayesian, call it logical—is just so perfect for forensic science. All the statisticians I know who have come into this field, and have looked at the problem of interpreting evidence within the context of the criminal trial, have come to see it as centring around Bayes's Theorem.' (Evett and Joyce 2005: 37).

The work of Evett and colleagues was further endorsed in the 1990s, when the FSS commissioned them to develop a framework which has become known as the Case Assessment and Interpretation (CAI) model. This latter development represents a particularly ambitious attempt to apply Bayesian probability to forensic science, and seeks to formulate a common epistemological and methodological basis for the analysis of evidence. It represents an attempt to construct an all-encompassing method of evidential interpretation for use in the course of criminal investigations, and seeks to shape the process of investigative reasoning in a way that logically accounts for epistemic risk. CAI seeks to engender greater accountability among forensic practitioners, and to more effectively manage the inherent uncertainties of criminal investigation.[2] Yet as I go on to describe below, CAI also represents an attempt to address the new realities of the market system. Hence it marks a notable attempt to reform the role and position of forensic scientists within the current criminal justice system.

II. Constructing Forensic 'Providers' and 'Users': The Case Assessment and Interpretation (CAI) Model

CAI is designed to be delivered to police users in three overarching phases: an initial 'customer requirement' phase, actual 'case assessment', and 'service delivery' of written statements of test results together with an assessment of their significance (Cook et al 1998a: 152). This process is sensitive to feedback, and continually subject to review with the customer; new lines of inquiry generated by subsequent developments can be readily incorporated into the framework. The customer requirement phase involves a rigorous consideration of the client's specific needs. Here, the construction of an appropriate 'framework of circumstances' is taken to be a necessary pre-requisite for the development of propositions relevant to the evidence and the case. The authors stress the need for scientists to take a 'balanced view' of each case, in line with what they regard as the principles of 'the Bayesian view of evidence, that it is not sensible for a scientist to attempt to concentrate on the validity of a particular proposition without considering at least one alternative' (Cook et al 1998a: 153).

[2] For an in-depth discussion of CAI, see the following: Cook et al (1998a, 1998b, 1999), Evett et al (2000a, 2000b), Jackson (2000, 2009), and Jackson et al (2006).

In the case assessment phase, the scientist is expected to further clarify the propositions police officers wish to investigate by re-describing them in more quantitative terms, via the generation of *likelihood ratios*, through which the scientist seeks to organize the logical processing of evidential propositions using Bayes Theorem. These take the form:

$$\frac{\textit{Probability of the evidence if prosecution proposition is true}}{\textit{Probability of the evidence if defence proposition is true}}$$

Prior probability estimates play an important role in the formation of likelihood ratios, with scientists being encouraged to base their prior estimates on the most robust foundations possible. In this way, CAI emphasizes transparency in terms of the assumptions used by scientists, even in the early stages of an investigation:

> There are things about what priors have we got and are they sound, are they realistic, are they robust and are we good at forming likelihoods with the evidence…So it's testable, it's exposed, it can be challenged, but it's explicit, people can see the priors that we are using…so anybody else can test them… (Interview with CAI Author, 2006)

As indicated by the concern to 'add value' to investigations, however, (Jackson 2000: 84) CAI seeks to link these kinds of analysis with the wider framework of circumstances of a case through the concept of the *hierarchy of propositions*, which plays a central role in organizing the way in which propositions are constructed and assessed. This hierarchy classifies propositions in order of their relevance to the ultimate issue under consideration by the court (Cook et al.1998b). Level I, or the *source* level, relates to propositions concerning the origins of the evidentiary material, and exclusively involves the measurement and comparison of quantitative data (Cook et al 1998b: 232-233). Level II in the hierarchy, the *activity* level, involves a greater element of reconstruction of the events in each case, and involves the use of Level I data to inform the construction of propositions regarding the kinds of activities which may have produced the forensic evidence. The final level in the hierarchy, Level III or the *offence* level, concerns the probability that a suspect has committed a criminal offence (Cook et al 1998b: 233).

Furthermore, CAI explicitly seeks to promote a mode of service provision which optimizes value for money to the primary customers of the FSS. CAI is intended to facilitate a more focused approach to the use of forensic evidence, promoting a new mode of engagement between forensic scientists and the police, capable of 'achieving improvement through a genuine *partnership* in which the customer has a greater participation than hitherto in decisions about what work is done in the laboratory' (Cook et al 1998a:152, emphasis added). This improved mode of consultation between 'providers' (forensic scientists), and 'customers' (police) is intended to ensure the latter gain an optimum return on their investment in scientific services. Moreover, CAI is intended to enable forensic scientists to advise police on the potential usefulness of specific scientific tests. This tailored approach benefits the provider by enabling them

to use their own resources as efficiently as possible, by minimizing the amount of redundant analyses they may have to carry out.

CAI can also however be seen to represent a certain desire among some forensic scientists to lead to a new appreciation of their potential role. As one of the developers of CAI commented:

> I think we have had a tendency to concentrate on providing analytical findings. By that I mean we reported the results of our analytical tests and we left the interpretation, or evaluation, of those results to others in the system. I believe that is a clear abrogation of our responsibilities for who else is better placed to evaluate test results? If we do not evaluate results, how do others evaluate them: what framework, what knowledge and what understanding do they have to help them evaluate the evidence in a robust, reliable way? (Jackson 2000: 83).

Yet attempts to apply CAI have not been without opposition. Within the framework of the CAI, the scientists are meant to act in a facilitative role, helping police to clarify the important questions to ask in the course of a case. For the CAI to function effectively, and for evidence to exert optimal impact on the course of a case if considered within this approach, forensic scientists need potentially high levels of information from the police. CAI also promotes the interests of scientists to exert a greater degree of influence with regard to which pieces of evidence are seen as most pertinent to a case. However, it became clear through field research that this potential re-positioning of forensic scientists within the decision-making hierarchy of investigative frameworks was not necessarily in keeping with traditional police views:

> We had another group of officers who kind of misinterpreted really…we had to reassure them we weren't out to help the defendant… (Interview with CAI author, 2007)

Instead, it appeared that some police investigators viewed the role of forensic scientists as somewhat more limited: to simply provide scientific data about evidence in relative isolation to the deliberations made by police concerning the progress of a criminal case.

Tensions also became apparent with another set of actors – the FSS management themselves. Although CAI emphasizes engagement with customers in order to facilitate an efficient use of the latter's resources, it appears that the framework clashed with certain management interests:

> …I think [the FSS management] felt some commercial problems…there was almost a counter-pressure not to apply CAI, because CAI in some ways, said 'lets just look at the items that are going to be really effective, really efficient, in addressing this question, and if you decide with the customer these are the key issues in the case, the strategy to address these key issues is this, this and this...' I think therein lay some of the difficulties from the managers and leaders,

> because you could see the natural consequences, if we apply CAI…we're going to lose a lot of income, potentially. (Interview with CAI author, 2007)

Nonetheless, CAI has exerted a tangible impact on the reporting practices used by forensic scientists. The Association of Forensic Science Providers (AFSP), which represents both external and in-house suppliers of scientific services to the police in the UK and the Republic of Ireland, has recently adopted a series of standards for reporting evidence which are closely modelled on CAI principles (AFSP 2009). This in itself reflects a significant degree of progress in promoting a renewed focus on evidence interpretation. Previous arrangements meant that forensic scientists operated in a largely prosecutorial role. Suspects were initially identified through non-forensic means, with the collection and analysis of forensic evidence largely being guided by the effort to incriminate them:

> It used to be like 'Life on Mars' really, you picked somebody who you thought might have done it and then tried to prove it, and if that didn't work you tried to prove somebody else did it. (Interview with Forensic Science Consultant, 2008)

The reporting standards recently promulgated by the AFSP mark a notable shift away from the 'Life on Mars' model. In line with Bayesian methods, forensic scientists are obliged, wherever possible, to analyse evidence with reference to two separate hypotheses relating to prosecution and defence positions, using the likelihood ratio system (AFSP 2009). Furthermore, prior to the analysis scientists are obliged to establish 'the key issues in the case' that evidential analysis would help inform, with recourse to discussions with 'the relevant client' (the definition of which encompasses not only the police and Crown Prosecution Service, but defence counsel as well). This is already reflected in changes to official police documentation. Police officers submitting evidence for analysis have to complete submission forms, in which they now have to explicitly state the questions that the analysis seeks to address:

> [The police] used to give everything to the lab, didn't tell them what they wanted…and then nine months later…you'd get your answers back, they'd say 'that's not what we wanted'! Never tell them [the forensic scientists] what they wanted in the first place, didn't really care too much as they weren't paying anyway! It was nonsense, the labs were swamped and couldn't cope…[the police] were never particularly good with what they submitted…laboratory submission forms now, you put down the reasons, rationale for everything you submit, its more like an order form…forces tend to be more deliberate about what they are asking... (Interview with NPIA representative 2010).

In this way, CAI has helped to promote the shaping of a more 'informed' customer. By obliging customers to be transparent about their investigative aims, it can be seen to have gained a foothold in influencing police behaviours through its adoption by the AFSP, and can be seen to have at least partially permeated into the reasoning processes of police customers. Such reforms have moved the role of forensic scientists from a largely prosecutorial orientation to a more balanced mode of inquiry where both

prosecution and defence positions are taken into account. In obligating police officers to specify with precision the inquisitorial aims of requested analyses, these reforms promote a certain sense of reflexivity in the clients of forensic science. This, along with the ability of forensic scientists to question police requests as specified in the AFSP guidelines (AFSP 2009), promotes the empowerment of forensic scientists (and 'science' as a whole), and enables 'informed' customers to become further educated.

CAI serves as a notable means through which the roles of forensic scientists and their customers are re-constructed, yet it also creates a distinct hierarchy. It promotes the image of the forensic scientist as instrumental to the investigative process. Scientific authority in this case is boosted by using a probabilistic 'scientific' discourse to not only promote more risk-manageable modes of inquiry, but to function as a device for managing the resources of both customer and provider in as cost-effective manner as possible. This particular construction of 'scientific' authority is not without its tensions however, and through them CAI serves to expose not only the epistemological differences to be found within the criminal justice system, but also ontological differences concerning the role and identity of forensic science, which runs counter to previously held notions about policing functions. In what follows I describe a series of initiatives which reflect centralizing tendencies which prioritize policing functions ahead of scientific concerns, but which do so in a manner which also reflects an orientation to neoliberal reform.

Police-Led Integration: Shaping the Structures of Scientific Support

I. Centralizing Science: The Home Office Science and Innovation Strategy

The presence of such tendencies can be identified clearly through initiatives such as the recent *Home Office Science and Innovation Strategy 2009-12*. This is stated as aiming to 'establish *priorities* for current and future science and technology applications and research', and 'to *co-ordinate* the development and implementation of technology between users and suppliers to ensure a coherent and effective process' (Home Office 2009: 3, original emphasis). It outlines 'the necessary capabilities which police forces need to establish to meet both national and their local priorities, and overall requirements in technology to provide those capabilities.'

The development and implementation of this Strategy is in turn overseen by the Police Science and Technology Strategy Group, which consists of a series of influential actors, including those tasked with organizing and overseeing the delivery of policing functions in general (Home Office, Association of Chief Police Officers (ACPO), Association of Police Authorities (APA) etc), together with the most prominent external supplier of scientific support (FSS). The 'strategy' that is being promulgated in this instance forms part of the overall National Policing Plan (NPP) for forces in England and Wales, the latter requiring that forces and police authorities should use the Strategy 'as a framework to inform their individual plans for the use of science and technology.' (Home Office 2009: 6).

It should be clear that the Strategy seeks to co-ordinate the introduction of scientific innovations in a largely centralized fashion. Despite the document stating that is not intended to 'usurp or replace individual plans and strategies' (6), it emphasizes the benefits of a common approach, supported on a national level:

> Working together rather than acting individually will allow forces to learn from each other by sharing solutions though in some cases solutions are best provided and funded nationally for the overall benefit of the service and the public. (Home Office 2009: 7)

Furthermore, while it is made clear that the Science and Innovation Strategy is intended to 'accelerate the improvement of police capabilities' to allow the latter to contribute 'most effectively to the delivery of national priorities', it is also notable in that it explicitly states '*it is not intended to promote science and technology for its own sake.*' (Home Office 2009: 7, emphasis added). Instead, the Strategy Group employs a method called 'top-down modelling' to understand the 'links between policing requirements and the individual technologies'. Based on existing systems developed by the military, models of the 'urban and general environment' are used to 'indicate how existing technology can assist in crime and terrorist environments, and how new technologies can develop new solutions'. Through this, the Strategy Group is able to 'influence and promote both the propagation and implementation of the strategy' (Home Office 2009: 7). It operates in order to maintain the authority of law enforcement agencies, shaped in a 'top-down' fashion by government priorities. Police oversight bodies such as ACPO, APA and the National Policing Improvement Agency (NPIA) therefore play an instrumental role in shaping the kinds of products, and their mode of provision, upon which their subordinates rely. The Strategy is therefore able to play an influential role in circumscribing the choices operational police officers are able to make with regard to the kind of technologies they wish to utilize.

II. Toward an Alternative Construction of 'Providers' and 'Customers': Forensics21 and the NFFA

Linked with these centralizing tendencies are a separate set of issues which state and police actors have used as justification to dictate the terms of the ongoing 'improvement' of scientific support. Here, the discourse is concerned with the way in which forensic science is able to conform to the measures of 'economy, efficiency and effectiveness' so closely associated with NPM. For example, the 'Forensics21' strategy recently launched by the NPIA, intended to shape 'a police-led forensic service fit for the 21st century' (Bramble 2009: 2), has sought to address certain priorities regarding the use and deployment of forensic science. These priorities reflect a number of perceived shortcomings, ranging from: high levels of variance between individual practitioners in terms of performance, 'unacceptable' rates of attrition, 'significant' variations in the ability of forces to convert identifications into detections, delays in updating marks and prints resulting in an 'unacceptable' number of potential suspects

being released from custody, and a 'fragmented' approach in terms of forces disseminating advice concerning the effective use and deployment of forensic techniques. Forensics21 currently involves a number of projects aimed at helping to address these and other perceived shortcomings in forensic science provision to the police. Aligned to this is the stated possibility of exploring in more detail 'how forensic science may be used to best effect', such that it provides direct benefits, e.g. 'reduced investigation time, increased detections, increased 'cold hits'; shorter time to arrest; improved public confidence; new links to outstanding crime; early intervention etc' (Bramble 2009: 4).

Forensics21 therefore represents a certain preoccupation with the constant improvement of forensic science in relation to a series of prioritized metrics relating to speed of delivery, standardization of practitioner behaviours, and investigative outcomes. The use of such 'targets' represents a sophisticated interpretation of the supposed tenets of NPM. The terms of 'improvement', and their instrumentalities, are very much set here by the overseers of policing, rather than scientists themselves. Hence this example shows further how this depiction of 'forensic science' is a form which is able to be readily shaped by central authority, with relatively little input from forensic scientists themselves in terms of how their discipline may develop. Rather than being regarded as a discipline in its own right, 'forensic science' once again becomes a term used more to describe a series of services, and less concerning a unique set of epistemic activities operating in accordance with common underlying principles.

The discourse in this case is therefore more concerned with how existing scientific initiatives and technologies can be applied to policing. Although such developments are recognized as potentially leading to certain changes in existing police approaches to criminal investigation, the process of the incorporation of new technologies is regarded as being relatively unproblematic, and indeed is regarded as largely benefiting and enhancing police procedures. Scientific contributions are intended to be incorporated into existing police practices, which implies a certain *a priori* acceptance of institutionalized epistemological behaviours, with 'scientific' evidence being able to be readily incorporated into existing procedural frames of reference. More notably still, it is apparent here that the epistemological foundations of this applied scientific knowledge are unproblematized and unchallenged by police and state actors. While science is viewed as providing an instrumental (and largely authoritative and immutable) solution to the societal risk of crime, far less concern is exhibited in relation to epistemic risk, the potential adverse outcomes associated with ignoring such risk, and the impact that such outcomes may have on the image of both policing and science. Moreover, less concern is given to the epistemic and/or cognitive processes used by forensic scientists, their potential fallibilities, or whether these kinds of reasoning behaviours may be particularly distinctive.[3]

[3] One other characteristic of this posture is the seeming conflation between forensic science (which is often exclusively associated with criminal *detection* in the writings of certain commentators), and crime *prevention*. Hence the strategic posture adopted here extends the use of science and technology to a further set of pre-emptive functions.

The influence of police-led integration is also evident in the operationalization of the National Forensic Framework Agreement (NFFA). This framework specifies in detail the arrangements for the procurement and provision of forensic sciences supplied by commercial FSPs. In entering into contract arrangements with police forces under the terms of the NFFA, FSPs are obliged to supply a highly specified form of scientific support across a range of specific, delineated criminal investigative functions. These functions, or 'work packages', range from routine scientific analyses in areas such as DNA analysis, fire investigation and footwear analysis, to more complex 'casework' packages relating to serious crime, where forensic scientists may be tasked with helping to interpret evidence in relation to a particular investigation. The repertoire of work packages offered under the terms of the NFFA represents the diversity of analytical activities performed by forensic scientists. Under the terms of each work package, specific forensic activities are clearly defined in a cost-code system:

> That's how it is now structured…codes refer to specific activities…for example, 'BFs' are body fluids, biology stuff. 01BF for example is the processing of stains from crime scenes for DNA purposes, a swab of blood from a windowsill, cigarette end left by a burglar, that sort of thing. Simple routine stuff. And that product, itself, has got requirements written in it that the company has to be able to provide… (Interview with NPIA representative, 2010).

However, the move toward such arrangements has met with opposition from scientists:

> There is quite a bit of 'anti' this, in the laboratory world, particularly the staff, the scientists, because they see it as too commercially focused now, and they haven't got the ability to use their own initiative, to innovate, because if it isn't within one of these products [codes], in theory the company couldn't charge for it, it might not be something the force has requested anyway…the scientists see it as a shackle… (Interview with NPIA representative 2010).

The perceived erosion of the professional autonomy of forensic scientists has stimulated concerns about whether the standardization of forensic science provision is affecting the interests of justice. As a recent investigation by the BBC Radio Four series *File on Four* uncovered, forensic scientists have expressed concerns about the way in which they have been directed by police when undertaking crime scene investigations. The cost code systems which are now used specify with great precision the analyses which forensic scientists are obliged to carry out. Yet the *File on Four* investigation demonstrated that forensic scientists often disagreed with police over the best course of action during casework, although they were often contractually constrained in terms of which activities they could undertake. The programme gave an example of one forensic scientist who had contributed to the successful investigation of a case only by ignoring police instructions and pursuing analyses which had not been originally commissioned (BBC 2009).

Under these arrangements, providers are largely obliged to be responsive to customers needs, rather than taking a proactive approach. This supports the assertion of Fraser (2007) who has argued that the introduction of a marketized system has led to a 'shift from the expert power of the laboratories to that of the police' (Fraser 2007: 384). With police largely dictating the type of scientific tests to be conducted, the epistemic standing of the forensic scientist is potentially under threat from certain aspects of the NFFA. Here, it can be seen that in many aspects of provision, there are tight controls surrounding the way in which forensic services are provided. The notion of 'partnership' found in the CAI literature is significantly under-represented here.

Discussion

The kinds of sites where the social and the scientific intertwine have constituted the focus of a number of influential studies which have sought to characterize the precise form and role that such sites play in stabilizing understandings of science (Starr and Griesemer 1989, Latour 1990, Callon 2006). This study has broadly relied upon identifying such points of intersection in order to investigate the relationship between modern policing and science by examining some of the kinds of formal guidelines, frameworks and strategies that have arisen in the light of recent infrastructural reform. I have sought to demonstrate how, through a focus on such initiatives, it is possible to show how scientific developments evolve interdependently with social orderings. These kinds of initiatives therefore represent highly useful sites through which to examine a particular process of co-evolution in an area which resists straightforward analysis.

Key to understanding this process are the differing normative interpretations of the course of scientific integration within policing. Williams (2007a) provides some guidance here in his distinction between so-called 'structural' and 'procedural' interpretations of scientific integration (Williams 2007a: 771). Here, 'structural' interpretations portray forensic science as a mere source of technical assistance to investigators, which emphasize the organization of forensic practitioners in the service of the police. 'Procedural' integration on the other hand, promotes an understanding of scientific support which 'acknowledges the distinctive knowledge-based expertise' of forensic practitioners (Williams 2007a: 772). The previous sections have sought to show how the 'procedural' interpretation inheres in attempts to promote scientific interests in forensic science, whereas 'structural' interpretations favour police interests.

It should be clear that the two sets of interests overlap and intertwine within the kind of initiatives outlined in this paper. Evidence interpretation based on AFSP principles forms one part of the activities specified in the 'casework' packages of the NFFA, and CAI is still reliant on the input of police customers for its operation. Nonetheless, each initiative strongly favours one or the other mode of integration. AFSP reporting guidelines are designed with customer consultation in mind, but very much in terms which favour a particular 'scientific' mode of reporting. Even though they allow customers to choose which evidence to submit, the use of CAI principles such as the hierarchy of propositions provides forensic scientists with powerful ways of justifying

advice regarding the potential usefulness of specific evidential analyses to an investigation. Conversely, while evidence interpretation is recognized in the NFFA, it is only specified in particular work packages in such a way that it dictates precisely *which* forensic scientists are contractually allowed to engage in interpretation. Hence each of these initiatives display design features which promote differential orderings of interests.

A focus on some of these features provides an indication of the way in which these differential orderings arise. The example of CAI demonstrates how an interest in bestowing greater epistemic independence to science is met using a probabilistic discourse to frame information exchanges in a quantitative manner, involving Bayes Theorem to assess 'prosecution' and 'defence' hypotheses. By rendering investigation in such a form, interests in maintaining perceived standards of scientific propriety are able to be advanced. Moreover, CAI can be seen to represent an attempt at the *general* reform of underlying processes, rather than seeking to meet the clearly stipulated objectives found in examples such as Forensics21. The ultimate outcomes of this reform process are not entirely specific, except that 'science' is regarded as marking out a gradual evolutionary course in an open-ended process of improvement of forensic practice.

The heavily quantitative orientation adopted by CAI also obligates scientists to adopt a position of greater epistemological transparency, an aspect which resonates with arguments to be found in the sociological literature. For example Rose (1996) argues that so-called 'advanced liberal' forms of governance detach expertise from political apparatus, re-positioning experts 'within a market governed by the rationalities of competition, accountability and consumer demand' (Rose 1996: 41). According to Rose, auditing becomes 'one of the key mechanisms for responding to the plurality of expertise and the inherent controversy and undecidability of its truth claims' (55). In effectively functioning as an epistemic audit, CAI embodies this aspect of liberalization, challenging the closed and opaque epistemologies previously accrued to many forms of forensic 'expertise'.

As well as promulgating a particular form of scientificity, CAI represents a distinct response to the implementation of a market system, by constructing the provider-customer relationship in a particular way. This in itself represents a particular appropriation of the modern liberal ethos which embraces the standardizing rationality of science as an important organizing principle. Through this rationality, CAI is also able promote a discourse of efficiency. Through a concern with resource constraints, it creates a representation of the scientist as the provider of a tailored 'value for money' service, able to advise an 'informed' customer on the probative 'worth' of a particular form of evidence in the light of a particular case.

While CAI largely favours scientific interests, an alternative, police-led integration agenda is more apparent in other initiatives. These help shape a decidedly instrumental form of scientific inquiry, focusing more on the importance of the applications of science and technology rather than exhibiting any overriding concern with the

'scientific method' *per se*. Here, forensic science becomes largely outcome-led. For example, under the control of the NFFA, scientific tests are sold in bulk, and activities are split into well-specified 'products'. The provision of forensic knowledge-forming activities is subject to ever greater forms of standardization, at the possible expense of the professional autonomy of scientists. Any underlying philosophical concern with the 'scientific method' is effectively 'black-boxed' (Latour 1987).

The NPM concern with performance measurement is prevalent in the edicts of Forensics21, which serves to drive technological innovation in a way which seeks to address a series of prioritized metrics of performance. Forensics21 may also be seen to be promoted in the name of 'accountability', albeit in a different fashion to science-led initiatives like CAI. As Power (2004) points out, the notion of public accountability has been reframed in the modern era in relation to business-led concepts such as goal definition, efficient resource allocation, and financial performance (Power 2004: 12). Initiatives such as Forensics21 represent a particular concern with public accountability, but which also feeds into the need for strong central control. The crisis caused by the emergence of the plurality of expertise generated by technological progress leads authorities to intervene in order to delineate precise forms of expertise and their mode of provision. This ensures that relevant forms of expertise meet with wider governmental objectives which are themselves subject to greater accountability. Hence, although the new accountability is meant to guard against the failures of a hierarchical, 'command and control' form of authority, central interventions, such as Forensics21, are required to ensure this new form of authority is maintained (Power 2004: 12-13). The central tension at the heart of modern liberal governance, between the need to devolve services, and the need to maintain control over the risks arising from such a devolution, is apparent in this case.

The initiatives described in this paper not only represent different, hybridized constructions of 'scientific' integration, but also display different aspects of liberalizing policies. Within these initiatives however can be seen sources of considerable tension, which may potentially affect the future viability of such forms. Many of these tensions originate from the actors themselves who are embedded in these assemblages. The means by which the design of these, and subsequent initiatives, continue to evolve, may be due in significant part to the precise way in which actors seek to either maintain or resist their position within these assemblages. The kinds of behaviours which actors adopt in order to do so represents just one further line of inquiry.

Given the plurality of products, services, and activities which this domain now encompasses, any attempt to understand the effect of commercial imperatives on the shaping of forensic science will necessarily have its limitations. This study has limited itself to examining just some of the responses to this trend. However, it has sought to build on previous studies of scientific commercialization (Mirowski and Van Horn 2005) by showing further how conceptions of 'commercialization' or 'liberalization' themselves *co*-emerge through the production of scientific knowledge. In terms of the wider social significance of this research orientation, it is worth noting that this ongoing process of co-emergence may have the potential to extend to other fundamental societal

norms. It is now apparent that discourses surrounding the concept of ‘value’ in forensic science are now extending to how that term relates to the delivery of justice (Discussion with FSS representative, 2010). Hence it may be the case that the concept of ‘justice’ itself is susceptible to being reconfigured and potentially swallowed by the co-production of science/neoliberalism. Many concerns have already been expressed within the law and forensic sectors about the potential tensions between commercial imperatives and judicial concerns (i.e. commercial confidentiality v disclosure etc), and whether judicial systems in England and Wales (and elsewhere) are suitably equipped to fully assess increasingly sophisticated scientific claims, potentially complicated further by the chaff of commerciality. The fluidity and pliability that the science/neoliberal nexus demonstrates bring concerns over whether it has the potential to infect adjacent juridical concerns. Precisely what do the processes of the future constructions of science and liberalization hold for the delivery of justice?

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