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## Review

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# Paradigms of forensic science and legal process: a critical diagnosis

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This article reconsiders the relationship between criminal adjudication and forensic expertise in the light of 'new paradigms' of forensic practice and recent law reform. It briefly summarizes conventional wisdom on the typical shortcomings of forensic science and other expert evidence, as a springboard for a more searching critical diagnosis of longstanding maladies. The fundamentally jurisdictional nature of law is emphasized, and some implications for expert testimony noted. English law's traditionally adversarial model of criminal procedure is then reassessed, taking account of a proper understanding of its normative structure and modern development, and drawing on comparative legal research and theorizing to obtain a more rounded second opinion. In conclusion, some avenues for intelligent prescription are canvassed, highlighting the importance of promoting and facilitating effective communication between experts, lawyers and courts, and prioritizing modest practical remedies over radical surgery.

## 1. Introduction: shifting paradigms

Scientific evidence and other forms of expert witness testimony have, over the course of the last century, become routine features of criminal proceedings in the UK's legal jurisdictions and around the globe [1–3]. This expansion is part and parcel of the increasing prominence of science and technology in all walks of modern life. Yet, increasing reliance on forensic experts is something of a double-edged sword for criminal justice. There can be no doubting the—sometimes, almost miraculous—power of forensic science in promoting the detection, investigation and successful prosecution of serious crime. But powerful medicine can have evil side-effects, if administered in excessive dosages or to the wrong patients. Precisely because scientific evidence often provides the best and most reliable proof of an offender's identity and has won for itself an aura of credibility verging—in some minds—on infallibility, flawed expert evidence can be a potent source of injustice. Recent years have witnessed, for example, mistaken allegations and wrongful convictions attributable to unreliable scientific or medical testimony [4–7] or contaminated forensic samples [8,9].

In an influential paper published a decade ago, Saks & Koehler [10] anticipated a 'paradigm shift' in the forensic sciences, from a model of improvised law enforcement practices learnt through on-the-job apprenticeship to a more rigorous methodology rooted in truly scientific principles and incorporating pertinent empirical data and statistics. The need for forensic science to raise its methodological game has subsequently been reinforced by a succession of official inquiries, authoritative reports and high profile miscarriages of justice—in the UK and overseas—all of which have contributed to a diffuse sense of unease surrounding forensic science. Nor did the Coalition Government's regrettable decision to close the Forensic Science Service (FSS) [11] do much to quell anxieties about the current condition and future prospects of UK forensics [12].

Meanwhile, criminal litigation in England and Wales has been undergoing major procedural and practical reform. There are numerous 'drivers': a conscious desire to improve conditions for children and other 'vulnerable or intimidated witnesses' (especially complainants); compliance with human rights legislation and the Article 6 'fair trial' jurisprudence of the European Court of Human Rights; ongoing modernization and law reform to eradicate

historical anomalies; and a new emphasis on pre-trial preparation and proactive judicial case management to improve efficiency and eliminate avoidable expense and delay. Adversarial stratagems are frowned upon; legal proceedings must be self-consciously orientated to the pursuit of justice; and resources must be managed wisely, a universal principle of good government lately underscored by the politics of austerity. These general policies have been extended specifically to forensic science and expert witness testimony in relation to, for example, reformulated duties for expert witnesses,<sup>1</sup> streamlined forensic reports<sup>2</sup> and augmented admissibility standards.<sup>3</sup> Post-FSS reliance on ‘the market’ to supply high-quality forensic science assistance to the administration of criminal justice might also—however problematically—be fitted into prevailing narratives of modernization, streamlining and efficiency.

If it is too much to say that both forensic science and criminal procedure are currently experiencing their own crises of identity, it is surely not melodramatic to regard them, and *a fortiori* their intersection in scientific evidence, as reaching a crossroads. Should forensic science embrace a new, ‘scientific’ paradigm? Should criminal procedure make a decisive break with its traditional practices and values? If evolution rather than revolution is the better (or more likely) reformist strategy, which aspects of tradition merit retention and which institutional practices need to change? Intelligent prescription presupposes informed diagnosis. Before starting to embrace new paradigms, we ought to have a secure sense of the meaning and value of existing models and methodologies. Unfortunately, in my experience, there is widespread ignorance and misunderstanding about the workings of criminal adjudication *and* regarding the nature of forensic science evidence, including among those who are professionally concerned with the administration of criminal justice. Criminal adjudication is complex. Misapprehensions are partly attributable to the fact that not everything in this field is as simple or straightforward or foolish or corrupt as it may appear on the surface, or from only one occupational or disciplinary perspective.

In order, hopefully, to move the reform discussion forward, this article revisits the diagnostic question and places it within the broader institutional context of criminal adjudication. Section 2 attempts to specify what actually goes wrong with forensic science evidence in contemporary criminal proceedings and to clarify the scope for effective remedial interventions. Section 3 draws attention to salient jurisprudential features of the institutional environment in which forensic science operates. These points of legal jurisdiction are sometimes underappreciated or overlooked, generating avoidable confusion, not least in debates about expert witness testimony and associated procedural reforms. Section 4 then reconsiders the traditional Anglophone model of criminal procedure and its implications for forensic science. Adversarial trial procedure is often blamed for distorting or corrupting forensic science evidence, and not only by forensic scientists smarting from an aggressive or disorientating courtroom cross-examination. I will argue that these familiar criticisms, when generalized and advanced as the basis for institutional reforms, are often misconceived or, at best, seriously question-begging and unpersuasive. The article concludes by indicating some directions in which intelligent prescription might build upon the foregoing diagnosis.

## 2. Triage: what is (supposedly) wrong with forensic science evidence?

As a convenient, if necessarily reductive, point of entry into contemporary debates and controversies concerning forensic science and expert witness testimony, the following ‘top 20’ summarizes frequently recycled criticisms and problems (in roughly logical sequence, rather than in any rank order of prevalence or significance):

- (1) *Junk science*.<sup>4</sup> Forensic science is invalid (in the straightforward sense that it does not ‘work’: tests do not measure what they purport to measure, and results do not show what they purport to show).
- (2) *Unvalidated and/or fallacious*. Forensic science techniques lack adequate validation, and in particular a proper statistical basis to support inferential generalizations.
- (3) *Operationally deficient processing*. Forensic laboratories and practitioners lack adequate protocols and procedures to preserve physical samples from contamination or confounding degradation.
- (4) *Methodologically unscientific*. Forensic science does not meet ‘scientific’ standards of objectivity, independence and impartiality/lack of bias, with particular susceptibility to ‘confirmation bias’ in reported findings [17].
- (5) *Human fallibility*. Forensic scientists and expert witnesses make mistakes.
- (6) *Charlatanism*. Experts are corrupt or incompetent fakers.
- (7) *Overreaching*. Genuine experts stray beyond the bounds of their legitimate expertise in providing forensic opinions.
- (8) *Institutional distortion*. Sound science is corrupted by institutional procedures and processes for commissioning (or not), generating and communicating the results of forensic testing (partly as a function of funding arrangements).
- (9) *Lawyer ignorance/deliberate manipulation*. Lawyers and courts do not understand science properly, and consequently mishandle it and/or abuse it for their own strategic ends.
- (10) *Communication failures*. Experts are incapable of expressing themselves (orally or in writing) in a manner comprehensible to non-specialists.
- (11) *Lax (‘liberal’) admissibility standards*. Courts too readily admit questionable scientific evidence at trial, thus exposing fact-finders to exaggerated risks of adjudicative error.
- (12) *Excessively demanding (‘conservative’) admissibility standards*. Courts too readily exclude novel or unconventional expert opinions, thus depriving fact-finders of information relevant to their decision-making.
- (13) *Testimonial silencing*. Trial procedures for eliciting oral testimony prevent expert witnesses from communicating their evidence in their own language and on their own terms.
- (14) *Adversarial deficit*. There is inadequate scientific support for the defence throughout the pre-trial and/or trial process.
- (15) *Manufactured disagreement*. Adversarial trial procedures accentuate minor discrepancies between expert opinions, while obscuring substantial agreement.
- (16) *Institutionally incompetent to resolve genuine disagreement*. Criminal trials are incompetent fora for attempting to resolve genuine scientific disagreements.

- (17) *Excessive jury deference*. Juries do not understand scientific evidence, and too easily defer to expert testimony.
- (18) *Excessive jury scepticism*. Juries do not understand scientific evidence and, consequently, fail to credit expert testimony with the probative value it truly merits.
- (19) *Number-blindness*. In particular, laypeople do not understand the probabilistic or statistical basis of scientific evidence, producing localized versions of (17) and/or (18) [18,19].
- (20) *Two antithetical cultures*. Law and science are methodologically incompatible, dooming forensic science—as the misbegotten issue of a ‘marriage of opposites’ [20]—to irreconcilable urges and a fundamentally conflicted personality [21,22].

Evidently, this charge-sheet is extraordinarily diverse. Though some of these criticisms should be taken more seriously than others (at least in the UK context), all of them are grounded in practical experiences of impropriety, mishaps and miscarriages of justice. Of course, to err is only human, but that does not disqualify criticism (5) as fatuous. The ineradicability of human error is an argument for institutionally robust systems of triangulation, double-checking, oversight and effective management of human risk factors. That several of these criticisms are mutually contradictory is an early clue to the scale and recalcitrance of the regulatory challenges posed by forensic science for the administration of criminal justice. It is highly unlikely that a single regulatory solution would be capable of addressing all, or even most, of these diverse concerns. Solutions to certain problems might simultaneously create or exacerbate other tensions elsewhere in the system.

Most of my ‘top 20’ entries are far from novel. Nearly all of these problems and criticisms were prominent in research conducted for the Runciman Royal Commission nearly 25 years ago [23–25]. Mutual misunderstanding, failures of communication and the (alleged) irrationalities of adversarial criminal procedure are constant refrains. The problem with these conventional diagnoses, in my opinion, is not that they are groundless, but rather that the underlying analysis is too often superficial and trapped in stereotypical thinking, producing predictably flawed prescriptions for institutional reform.

Forensic science is fundamentally an *applied* branch of scientific endeavour with existential claims to practical, instrumental value. Hence, a standard definition of ‘forensics’ is ‘science applied to the administration of justice’ [26,27]. Although forensic science is appropriately characterized as a genuine partnership between scientists on the one hand and criminal investigators, lawyers and courts on the other, in terms of the structural logic of criminal adjudication science is necessarily subservient to a legally defined conception of justice. This is why criticism (20), which superficially appears to expose a profound and enduring source of cultural estrangement, is not nearly as insightful as it seems [28]. For although there are undoubtedly pronounced differences in the manner in which lawyers and scientists go about their daily business and in their respective cultures and professional ideals, forensic science is actually in the law business<sup>5</sup> and it cannot succeed, according to its own lights, unless it can successfully adapt scientific knowledge to legal requirements. This elementary ranking of priorities is

not always fully appreciated, or may be temporarily forgotten in the heat of debate.

### 3. Legal jurisdiction

Law is inherently jurisdiction-specific, in a way that forensic science *qua* science is not. It is natural to think—and my impression is that many forensic practitioners *do* think—that forensic science is inherently good, bad or indifferent, as the case may be, irrespective of its historical, geographical or institutional context. This assumption is underpinned by robust scientific norms of objectivity, validity, replicability, ‘consensibility’<sup>6</sup> and so forth. However, from a legal perspective, the value and quality of forensic science are always contextually variable, in the sense that what may constitute good evidence for justice in some places or cases would be useless or unacceptable in others—depending on legal definition, local procedural traditions, broader social expectations and the material facts in issue in any particular case. This pervasive sensitivity to institutional context threatens to turn any generalization about forensic science or other expert evidence into indefensible dogma. Expert evidence of all kinds, even the testimony of an expert astrologer or magician,<sup>7</sup> could conceivably be relevant and epistemically well-warranted in criminal proceedings.

It is tempting to think that diverse forms of expert evidence should ideally be governed by their own tailor-made schemes of legal regulation. But topical differentiation can only work if it is possible to specify operationally robust distinctions between different kinds of expert evidence. The most plausible division is between ‘scientific’ and ‘non-scientific’ expertise. The Law Commission in its recent re-examination of the admissibility of expert evidence in criminal trials was initially attracted to this idea,<sup>8</sup> but later softened its approach,<sup>9</sup> I think for good reason. US experience teaches that the science/non-science divide offers neither greater clarity nor stable consensus than the primary expert/non-expert dichotomy [30]. The operative concept in English law remains ‘expert’, rather than ‘science’ or anything claiming similar methodological stringency. This approach endows the legal rules with maximum coverage and inclusivity: the substantive field and content of expert evidence could be just about anything, so long as it relates to a disputed question of fact at issue in the proceedings. If English criminal litigation is too conservative in its reception of novel or unorthodox science (criticism (12) in the ‘top 20’), it is not because the formal rules of admissibility—before or after their recent revision—are too restrictive in defining ‘experts’. A generic approach does, however, entail that the rules are written at a fairly high level of abstraction, often requiring significant interpretational effort to apply them to the instant case.

On first principles [31–33] expert testimony adduced in criminal trials must be both (i) relevant to a live fact in issue (i.e. ‘material’ to the proceedings); and (ii) not otherwise excluded by an applicable generic<sup>10</sup> or expertise-specific exclusionary rule. ‘Logic and common sense’ are the overriding criteria of relevance in English law—a foundational precept of rationality in adjudication [34,35]. Although it is conventionally said that expert evidence is admissible by way of exception to ‘the opinion evidence rule’, this is an unhelpful and potentially misleading canard. It presupposes a clear distinction between ‘facts’ and ‘opinions’, where in

reality there is a continuum defined by different levels of granularity in the description of factual inferences from observations. Like all other evidence, some expert witness testimony—e.g. chemical analysis of suspected narcotics—lies towards the brute ‘fact’ pole, while other testimony—e.g. a medical diagnosis or a scientist’s assessment of the likelihood of the persistence of transferred material—lies more towards the ‘opinion’ pole. One might expect genuine experts to agree about authentic scientific facts, whereas genuine differences of opinion are commonplace among specialists. However, one might just as well say that scientific facts are those matters about which genuine experts agree, whereas opinions allow for good faith disagreements. There is, in other words, no independent criterion to arbitrate the institutionally constructed borderline differentiating facts from opinions.

Positive law defines the material ‘issues’ for criminal litigation at two distinct levels of analysis, which operate cumulatively. First, substantive criminal law specifies the elements of criminal offences that must be proved to secure a conviction, alongside general doctrines of liability, excuse and justification. The boundaries of substantive criminal liability differ in many significant details from one legal jurisdiction to another. Secondly, the matters in issue in particular criminal trials are further refined through situational combinations of criminal procedure law (including evidentiary rules of admissibility and exclusion), local practice and particular litigants’ forensic strategies. These supervening aspects of procedure and practice tend to be significantly more diverse and influenced by local legal traditions than the scope and content of substantive criminal law.<sup>11</sup> My list of ‘top 20’ criticisms is recognizably Anglophone, in twice explicitly referring to (and otherwise implicitly assuming) ‘adversarial’ trial procedure. The theory of adversarialism presupposes that the prosecution’s case, including any expert evidence on which the prosecution proposes to reply, will be open to scrutiny and vigorous cross-examination by the defence, lending piquancy to criticism (14), the possibility of ‘adversarial deficit’. Defence lawyers will not, in general, be able to conduct an informed evaluation of the strengths and weaknesses of scientific evidence adduced by the prosecution unless they can instruct their own well-qualified scientific advisors. Less adversarial (or ‘inquisitorial’<sup>12</sup>) systems of criminal adjudication prefer to dispense with courtroom challenges to scientific evidence, characteristically relying on the uncontradicted evidence and advice of court-appointed experts. This manner of proceeding pre-empts some well-known difficulties—including criticisms (15) and (16) relating to real and imagined scientific disagreements—but tends to create or exacerbate mirror-image problems. Local commentators worry that inquisitorially minded judges defer too readily to the orthodox opinions of well-credentialed experts, which escape rigorous testing—potentially risking miscarriages of justice. Such observations generalize throughout contemporary comparative law scholarship. Rival procedural models present a suite of options, but no magic bullets or panaceas. The perceived weaknesses of one model are frequently apprehended as the strengths of another.

The adversarial/inquisitorial continuum represents only one vector of comparative analysis. There are major differences in criminal procedure *within* the ‘adversarial’ and ‘inquisitorial’ procedural families.<sup>13</sup> Indeed, it is common for civil (private law) and criminal adjudication to be conducted very differently within the same territorial jurisdiction.

Expert evidence deemed adequate for one juridical purpose (e.g. family proceedings) may be inadmissible in a criminal trial, owing, for example, to more exacting fair trial and due process requirements and the higher standard of proof in criminal proceedings. Prosaic institutional realities must not be overlooked in comparative modelling. We need to be concerned not merely with the formalistic ‘law in the books’, but also with the sociological realities of ‘the law in action’. Criticism (14), for example, is as much concerned with the availability of competent experts willing to take on defence work and the provision of state-funded legal aid to pay for them as it is with overarching models of criminal procedure. Provision of legally aided defence expertise in the USA appears threadbare from a British perspective (cf. [38]); though this is no excuse for self-satisfied complacency, and it must be said that the future of publicly funded defence forensics in English criminal proceedings does not, at this point in time, seem very rosy.

Orthodox accounts of legal jurisdiction must confront the emergent realities of globalization and cosmopolitan jurisprudence. Today, law characteristically travels, crosses borders and engages in transnational conversations; and as law impacts on the places it visits, so in its turn law is affected by, and adapts in response to, its cosmopolitan institutional and cross-cultural adventures.<sup>14</sup> Law reformers, no less than practitioners, must engage with dynamic legal environments, in which the power of states to legislate and regulate has been curtailed—but also in some important respects enhanced—by global political, economic and social forces. Forensic science, for example, is now subject to aspects of pan-European regulation [44]. Nonetheless, modern criminal law remains on a jurisdictionally national (or state) default-setting. In particular, the generation, admissibility and uses of forensic science evidence are still predominantly regulated by national courts. One must consequently be wary of overgeneralizing from the peculiarities of individual legal systems or casually extrapolating from one legal jurisdiction to another or others that may well exhibit significant procedural, cultural or practical differences. So far as *criminal* law is concerned, the relevant jurisdiction is England and Wales—and English criminal procedure law is this article’s primary reference point.

Expert evidence, of fact or opinion, is admissible in English criminal trials when it is both relevant and helpful<sup>15</sup> to the fact-finder in discharging its adjudicative responsibilities. Unhelpful expert testimony is superfluous at best, and possibly worse than useless in potentially confusing the issue and imposing avoidable costs on litigation. Such evidence is inadmissible, not only at law, but also as a direct extrapolation from the basic canons of rationality. ‘Helpfulness’ is a flexible standard requiring fact-sensitive contextual application. Trial judges are sometimes called upon to make close judgement calls, weighing up the anticipated probative value of the evidence in resolving disputed facts, against its potential for mischief. The Court of Appeal is unlikely to interfere, unless the trial judge’s decision has strayed off into what common lawyers call ‘*Wednesbury* unreasonableness’.<sup>16</sup> Besides, individual admissibility determinations (including those upheld on appeal) are not, for the most part, formal legal precedents, but rather contextual applications of general legal principles.

A second topic-specific prerequisite to admissibility is that evidence is proffered by a genuine, properly qualified expert. Unless the witness is a legally competent expert, there would



be no rational basis for treating the witness's evidence as authoritative or reliable. English law's test of expertise is substantive, not formal: provided that the expert actually has the relevant specialist knowledge or expertise it does not matter how, when, where or why such expertise was acquired.<sup>17</sup> Education, training and formal qualifications may demonstrate expertise, but are not necessarily required to constitute it. For example, an expert could conceivably have acquired consummate skill as a lip-reader<sup>18</sup> or foreign language interpreter without obtaining any formal qualifications. However, there may be areas of forensic science or other expertise that in practice can be acquired only through formal training or accreditation; and this in itself may give rise to concern about the availability of qualified experts to assist both prosecution and defence in adversarial criminal litigation.<sup>19</sup>

#### 4. (Mis)diagnosis: (Under)appreciating procedural tradition

Over a century ago, an eminent US jurist wrote:

[H]ow can the jury judge between two statements each founded upon an experience confessedly foreign in kind to their own? It is just because they are incompetent for such a task that the expert is necessary at all. ... One thing is certain, they will do no better with the so-called testimony of experts than without, except where it is unanimous. If the jury must decide between such they are as badly off as if they had none to help [45, pp. 54 and 56].

In this quotation, Learned Hand extracts the pith of 'top 20' criticisms (15) to (18), and prefigures extensive modern discussion of the central education/deference dynamic framing courtroom expert testimony [46–51]. Unless jurors can be educated in pertinent specialist knowledge during the course of the proceedings, their only rational option is seemingly to defer to an expert's opinion. But how, then, is the jury supposed to proceed when expert opinion conflicts? Contemporary critics have reprised Hand's argument for reliance on court-appointed experts with equal vigour and rhetorical facility, and been met with continuing institutional intransigence and cultural resistance ([52,53], and in rejoinder [54]). If the diagnosis is correct, why will nobody administer the medicine?

One answer, possibly not lacking popular resonance, is that lawyers are personally and professionally invested in the existing procedural system, which they control and which is run largely for their own benefit and convenience, and they are too conservative and/or lazy and/or venal to change it. This is the (also very superannuated) argument implicating what Bentham called the 'sinister interests' of 'Judge & Co.'. To my mind, it reflects a misunderstanding of adversarial procedure, at two levels. It also underestimates the extent to which significant procedural reform has already been implemented, especially during the last decade or so.

The first level of misunderstanding concerns the somewhat complex relationship between adversarial criminal procedure and truth-finding in adjudication. Lawyers, it is said, play adversarial games and courts are concerned only with forensic *proof* rather than the factual *truth* of 'what really happened' regarding disputed facts. Critics fail to appreciate that adversarial procedure is designed to promote truth-seeking not to frustrate it. Before sceptical readers fall about laughing, let me stress that this is a claim about the system as a whole and

its institutional design, not about the motivations of professional participants in particular cases. Indeed, the very self-serving partisanship which adversarial lawyers are expected to display in developing their litigation strategies is the motor that drives adversarial truth-seeking. The parties have both the presumptive knowledge and the strongest motivation to present their own best cases to the fact-finder, and to interrogate their adversarial opponent's arguments and supporting evidence through vigorous cross-examination. Adversarialism is an incomparably efficient way of narrowing down the issues and getting to the heart of factual disputes [51,55]. Criminal procedure regulates not only the generation and presentation of evidence, but also its testing and evaluation. It is surely plausible to maintain, as a general proposition, that evidence that has withstood concerted forensic examination offers securer epistemic warrant for judicial fact-finding and jury verdicts than evidence that has never been tested in the forensic crucible.

This is not to deny that adversarialism is capable of generating perverse incentives for the parties to defeat truth-seeking. To the contrary, there is ample experience and some research evidence to confirm the common sense prediction, that police, prosecutors and defence lawyers have been known to present false evidence or conceal relevant information [56–58]. More routinely, trial advocates attempt to 'spin' their cases to their own strategic advantage. Elements of these behaviours shade off into outright criminality—perverting the course of justice—or, at the least, involve blatant contravention of institutional directives, procedural rules or professional ethical standards. Deliberate rule-breaking that threatens the proper administration of justice would potentially undermine any conceivable procedural arrangements, and must be regulated and policed in its own terms. Nobody, I take it, thinks that corrupt police officers or unethical lawyering are exclusively found in jurisdictions with adversarial procedures. Officials' criminality or ethical incompetence cannot plausibly be laid at the door of adversarialism.

Rule-breaking aside, it might be said that adversarial procedure especially encourages, and empowers, police, prosecutors and defence lawyers to stretch the boundaries of ethical behaviour by using information very selectively, suppressing any potentially relevant information unhelpful to their own case that they are not positively legally bound to disclose, and presenting their cases to fact-finders in a highly suggestive and carefully scripted manner sometimes arguably bordering on active deception or 'lying by omission'. These allegations are not groundless. Sophisticated comparative lawyers have concluded that 'inquisitorial' systems of criminal procedure, which predominate outside Anglophone jurisdictions, are culturally and ideologically more committed to truth-seeking than adjudication organized on adversarial lines [59]. The general worry is compounded in relation to expert evidence, because science is expected to be the paradigm of objectivity and factual rectitude and there are enhanced risks, relative to lay witnesses of fact, that experts themselves might collude with or be co-opted into adversarial partisanship.

At this tipping-point in the discussion, we are in danger of getting carried away with crude, stereotypical models of adversarial procedure. Legal jurisdictions in reality vary enormously in the extent and manner of their adversarialness. For example, in England and Wales (and across most of the Commonwealth), prosecutors are placed under fairly stringent professional duties of disclosure and restraint, and are

required to behave as ‘ministers of justice’ in pursuit of the public interest at the same time as performing the procedural role of adversarial litigant. Prosecutorial responsibilities are strikingly asymmetric: where the defence has any corresponding duty at all, it is far less onerous than the prosecutor’s. The situation seems to be rather different in the USA, especially as regards more limited pre-trial ‘discovery’. On the other hand, criminal procedure across the US states is governed by federal constitutional standards not directly replicated in other common law jurisdictions. The important point to stress, for present purposes, is that simplistic models of adversarial contest—the ‘boxing match theory’ of justice—are seriously deficient and misleading, because real-life proceedings are governed by detailed sets of legal rules and ethical standards requiring professional conduct that would be completely irrational (‘fighting with one hand tied behind your back’; ‘helping your opponent’) in a no-holds-barred forensic contest. The formal juridical pedigree of applicable normative standards is less significant than their cultural status and practical institutional backing. In England and Wales, at least, it is my impression that delegated or ‘soft law’ norms such as the PACE Codes of Practice, the CPS Code for Crown Prosecutors and the Bar Code of Conduct are treated as no less<sup>20</sup> binding in the day-to-day conduct of criminal investigations, prosecutions and trials than primary legislation.

Comparative criminology and socio-legal scholarship continually rediscover that procedural models are mediated by institutional culture and the working routines of frontline practitioners [60,61]. The version of adversarial criminal procedure practised in England and Wales owes as much to prevailing cultural expectations as it does to an abstract ideological commitment to adversarialism. Drawing essential nourishment from its rich but also somewhat protean institutional cultural environment, procedural tradition is simultaneously enduring and fragile. It is vulnerable to hostile external policy pressures, internal defection (e.g. where jaded practitioners capitulate to cynicism), and failures to reproduce itself through education and (positive) acculturation. Notably, serious efforts have been made in recent years to spell out and advertise professional ethical duties for expert witnesses in case law<sup>21</sup> and delegated procedural instruments,<sup>22</sup> but I am not sure how widely the message has been received and understood. Do expert witnesses really appreciate what it means to participate in an adversarial system of criminal justice, or have their understandings and expectations been warped by pervasive cultural stereotypes and simplistic media portrayals? This is a doubtless impertinent, but necessary, question that individual expert witnesses must ultimately answer for themselves. Enough has been said to demonstrate that healthy versions of adversarialism depend, in part, on the accuracy and perceptiveness of practitioners’ own self-understandings of adversarial culture and their commitment to its routine reproduction through conscientious performance of their own, and their colleagues’, respective professional roles and duties. Intelligently appraising adversarialism is not merely an ‘academic’ preoccupation remote from everyday practical or policy concerns. All citizens are invested in it (whether or not they realize it), and expert witnesses more than most.

One might still argue that, even when operating according to its design specification and staffed by competent and conscientious professionals, adversarial procedure is not a rational way of conducting criminal adjudication in general;

or, more modestly and pertinently, not a rational way of conducting criminal adjudication involving significant scientific or other expert evidence. This brings me to the second level of misunderstandings previously mentioned.

Note, to begin with, that finding fault with adversarialism can only ever be half the story. Assuming that we are not going to abandon criminal adjudication altogether,<sup>23</sup> adversarialism, notwithstanding its many arguable faults and practical shortcomings, will remain the enduring default option unless and until some normatively superior *and practically viable* alternative institutional arrangement can be specified. Behavioural science research criticizing existing judicial procedure is frequently silent on the vital question of practical alternatives or concludes with sketchy suggestions lacking institutional realism. Adversarial criminal procedure does not need to be an idealist’s paragon to deflect criticism, but only, in the final analysis, *the least worst practical alternative*. Even if the most that can be said for the version of adversarial criminal procedure adopted in a particular jurisdiction is that it is ‘the best of a bad lot’, the nuclear options of either having the police take suspects directly to jail without any intervening judicial process (i.e. a ‘police state’ operating administrative detention), or abandoning all pretensions to retributive justice and crime control through penal sanctions (scrapping criminal law) are far, far worse.

This begs the question: *is* adversarial criminal procedure (as actually practised in England and Wales) *in fact* the best option, or are there practically viable options that could, and perhaps should, replace it? Two methodological considerations seriously complicate efforts to answer this question. First, answers must be jurisdiction-specific, taking account of local procedural traditions and institutional culture. There is no absolute ‘best’ at large, but only relative best *for a particular legal system at a particular point in time*. Secondly, the criteria of excellence for models of criminal adjudication are primarily normative and only secondarily epistemic. That is to say, criminal procedure must first and foremost satisfy the requirements of justice, for which a commitment to truth-finding is a necessary but by no means sufficient or even predominant condition. Framed in broader jurisprudential context, liberal conceptions of the rule of law demand that systems of criminal adjudication must secure legitimacy, both *normatively* as a matter of idealist political morality (theories of justice) and *sociologically* in terms of sustaining public confidence in criminal verdicts in individual cases and in the general administration of criminal justice (normative criteria of democracy and effectiveness).

Self-evidently, adversarial criminal procedure is not the only viable model of adjudication available to Western liberal democracies (to keep the discussion focused on meaningful local options, assuming that the UK will remain a liberal democracy for the foreseeable future). Unless we are to say, utterly implausibly, that English-speaking peoples have the global monopoly on fairness and rationality in criminal adjudication, the possibility of alternative, including ‘inquisitorial’, procedural models must be conceded. But three important further qualifications are necessary.

Firstly, there is a notable general trend in criminal procedure reform, across Western Europe and beyond, for traditionally ‘inquisitorial’ systems to adopt increasingly more adversarial features and to inculcate a more ‘contentious’ [62] cultural orientation in the conduct of criminal proceedings. In 1988, Italy went so far as to attempt a wholesale introduction

of adversarial trial procedure by legislative fiat [63,64], albeit with (sociologically predictable) cultural confusion and elements of occupational resistance, which have yet to be fully resolved. The geographical expansion of adversarialism is fuelled by institutional innovations in international criminal justice [65,66] and, above all, by the programmatic agendas of the Council of Europe and the (juridically and functionally separate) EU. The European Court of Human Rights has repeatedly said that elements of adversarial procedure are necessarily implied by the right to a fair trial guaranteed by Article 6 of the European Convention on Human Rights (which has 47 states parties, comprising about a quarter of all the world's countries).<sup>24</sup> EU criminal law, too, propounds procedural protections for suspects and the accused, predicated on more proactive models of criminal defence characteristic of adversarial jurisdictions [68,69]. The pragmatic realities of constitutional politics and contemporary international relations thus presuppose that criminal procedure must be substantially adversarial. National legislative choices have accordingly been redefined as questions of degree, ideological emphasis, cultural style and detailed institutional design.

Secondly, with particular respect to forensic science and other expert evidence, there is evident growing disquiet among local commentators about the propensity for inquisitorial process and court-appointed experts to produce suboptimal outcomes, including miscarriages of justice.<sup>25</sup> Pitched at a general level, adversarialism and inquisitorialism can be regarded as having mirror-image strengths and weaknesses. Adversarial procedure is strong on party autonomy and vigorous cross-examination, but vulnerable to partisanship and distortion in fact-finding. Inquisitorial procedure (ideally) encourages comprehensive, objective judicial inquiry into all relevant matters, but disempowers the parties relative to the tribunal and may prioritize securing bureaucratically efficient case-processing, oiled by conventional professional (include expert) consensus, over more time-consuming forensic conflict, searching evidential scrutiny, minority viewpoints or dissenting voices. Conventional wisdom is no more an infallible guide to the truth of disputed events than adversarial argument. Playing off abstract procedural models against each other thus tends to exhaust itself in an unilluminating theoretical impasse, particularly in light of what has already been said about the practical significance of institutional cultures and practitioners' working routines for the quality of the administration of criminal justice in particular jurisdictions.

Which brings me to the third, and methodologically most substantial, qualification on the pretensions of inquisitorialism. As the criteria of procedural excellence are relative to particular legal jurisdictions, the transportability of procedural models across national borders cannot be assumed. Institutional arrangements uncontroversially satisfying elementary rule-of-law requirements in one jurisdiction might be utterly repugnant to local traditions and socially and politically toxic elsewhere. In The Netherlands, for example, criminal justice is administered as a professionalized bureaucracy with activist judges, court-appointed experts and no lay jurors or magistrates [72–74], and this seems to be perfectly acceptable to the Dutch. English-speaking parts of the globe, by contrast, generally regard adversarial party autonomy and lay fact-finding as essential structural features of criminal adjudication, features which are closely associated with core fair trial principles of open justice, orality, publicity and intelligible due process.

These are not just lawyers' professional values, but socially diffuse cultural traditions embedded in community sentiment, political rhetoric and intersecting legislative policies. Criminal proceedings on both sides of the North Sea are in principle compliant with ECHR Article 6. But whereas to continental observers English criminal proceedings appear anachronistic, antagonistic, capricious, imperfectly rational and not fully compliant with the rule of law (see further e.g. [75,76]) continental criminal procedure viewed from a British perspective seems cumbersome, inflexible, cliquy, inaccessible, undemocratic and surprisingly complacent in its routine fact-finding (cf. [77,78]), for a system supposedly founded upon an uncompromising search for truth. Globalization and legal cosmopolitanism have barely closed the short geographical distance between these rival procedural traditions, which—when local particularities are examined at close-range—still seem worlds apart on myriad details of institutional design, operational protocols and cultural values.

The demands of legitimacy, in both its normative and sociological registers, have profound and far-reaching implications for the conduct of criminal adjudication. In a contested criminal trial in England and Wales, the prosecution must be able to adduce persuasive proof of guilt in open court, normally by eliciting the oral testimony of witnesses who are physically present in the witness-box (there may also be supporting documentary evidence and physical exhibits). The prosecution's evidence must be expressed in terms that a lay jury can understand and, if persuaded by it, accept as a legitimate basis for imposing penal censure and sanctions on the accused. In this procedural tradition, the jury is the ultimate arbiter of fact, and a criminal trial jury is not obliged to accept even uncontested expert evidence on technical matters.<sup>26</sup> Some might regard this as irrational; surely, *ex hypothesi*, the expert knows best? But even if the expert *does* know best within his or her sphere of technical competence, this does not settle procedural or substantive questions of *justice*. In the type of legal system in which deference to specialist expertise is the cultural norm, the legitimacy of forensic fact-finding is underwritten by faith in scientific rationality and the integrity of the judicial process for selecting competent court-appointed experts. But I cannot imagine this arrangement ever being acceptable in England and Wales, where the prevailing attitude towards expertise is one of, let us say, contingent credibility subject to satisfactory performance. In an informal sense, expert evidence is always received *de bene esse* (by legal indulgence), just as authority figures in general do not command automatic social deference. We generally expect there to be two sides to any argument, and scientific disputes are no exception. Indeed, expertise of all kinds is tainted by the whiff of anti-democratic dogma, to the point where, apparently, many people—wrongly—believe that scientific facts are just another set of partisan opinions sponsored by special interests.<sup>27</sup>

It is obscure to me what some critics of adversarialism envisage as a viable alternative model of criminal adjudication. Judge-only 'bench trials' are used in many common law jurisdictions [80,81], but generally only after jury trial has been waived by the defence, or in exigent circumstances (e.g. for terrorist or gangland trials, where jury-nobbling is seriously feared or suspected).<sup>28</sup> Politicians who try to restrict jury trial in England and Wales typically provoke a legislative and popular backlash [82,83], unless they can proceed indirectly, and by stealth. This should tell us something

about the enduring cultural significance of trial by jury in our political culture. One sometimes wonders whether critics would like to see lay jurors replaced by expert panels of behavioural scientists or statisticians applying Bayes theorem. The moral to be drawn from such unlikely thought-experiments is that technical expertise may be ‘too true to be good’ [30, p. 702–703], for the practical purposes of criminal adjudication. Jurors cannot accept and act upon information which they cannot understand or process rationally. This threshold epistemic constraint has the salutary effect of forcing expert witnesses to communicate their evidence in language that is reasonably comprehensible to ordinary people, concentrating on material issues in the trial and at a level of granularity and technical detail pertinent to the jury’s task in arriving at an institutionally competent verdict.

In summary, legitimacy demands that adequate epistemic warrant for criminal adjudication must be *demonstrably* sound, not just endorsed as valid by specialist expert communities. Justice must be ‘seen to be done’; miraculous revelation cannot secure legitimacy for criminal verdicts in England and Wales. Bayesians and behavioural scientists are, in this sense, no different from somebody who claims to have invented a magic credibility machine or to have paranormal powers to channel divine omniscience. The persuasive burden lies squarely on the shoulders of critics of traditional adjudicative practices, and the argument must be addressed to legislators, policymakers and the public at large, rather than to judges or juries. As a challenge to orthodox jurisprudential (and constitutional) frameworks, it cannot realistically expect to gain any traction at the level of individual cases or contested trials. Unless the jury can appreciate, at least in broad terms, why an expert has arrived at particular conclusions, it will not—and should not—condemn the accused as a criminal wrongdoer (or, for that matter, acquit a defendant whom it otherwise believes guilty on the evidence).

One can certainly debate the merits of these institutional arrangements, either as a purely intellectual exercise or with programmatic objectives. However, pending wholesale radical reform, this is the system of criminal adjudication we have in England and Wales, it is hallowed by longstanding tradition, and—apparently—enjoys widespread cultural support. Broadly speaking, it seems to work for us; and so far as I can discern, there are no grounds for thinking that it is any less rational, effective or successful by its own lights than models of criminal adjudication found in other legal jurisdictions which place greater reliance in fact-finding on technical expertise.

## 5. Conclusion: paradigms and prescriptions

Science appears in court as the handmaiden of justice and is, in that fundamental sense, subservient to juristic ends. Common law judges have consistently emphasized that trial with expert witnesses’ input must never become trial by experts usurping the proper, constitutional role of lay fact-finders. Yet at the same time, it would seem rational for fact-finders to defer to expert knowledge presented to them, at least when it truly concerns matters within the witness’s field of expertise, is pertinent to the determination of disputed facts and is not contradicted by counter-expertise. Enduring unresolved tensions between expertise and lay adjudication grow in practical significance as the courts’

reliance on new and increasingly powerful forms of scientific evidence continues to expand.

Cutting-edge science tends to be somewhat experimental, and early enthusiasms may need to be curbed in the light of further, sobering, experience. The methodological credentials of some forms of forensic expertise have been challenged and exposed as ‘junk science’. Further difficulties arise in relation to statistics and probabilities [84,85].<sup>29</sup> Even if experts present scrupulously sound testimony, there is no guarantee that lay fact-finders will crack experts’ linguistic codes and be able to give scientific evidence the probative value it truly merits on the facts [86]. There have been instances of genuine experts overreaching the boundaries of their legitimate expertise and isolated allegations of phoney proffered expertise (‘charlatanism’). Sometimes well-qualified experts disagree with one another, potentially leaving lay fact-finders in a quandary.<sup>30</sup> Psychiatric and psychological testimony poses additional problems, arising from the inherent difficulties of obtaining reliable information about mental states and conditions, and applying relevant legal (*mens rea*) concepts and criminal law defences to prove mental states (not to mention the propensity of some expert witnesses to pad out their reports with inadmissible hearsay and to stray into areas of normative appraisal properly reserved for the court [87]).

For these and other reasons, summarized in §2, forensic science evidence and other expert testimony should always be approached with circumspection. Investigators, prosecutors, defence lawyers and courts need to be attentive both to what specific fact or facts scientific evidence purports to prove (questions of relevance and materiality), and to the strength of the inferential conclusion to which the evidence points (the probative value or weight of the evidence). Scientific evidence is capable of being dispositive of criminal proceedings, even in the absence of a contested trial. Defence counsel may be inclined to advise their clients to plead guilty if the (apparent) strength of the scientific case against the accused appears overwhelming. Whomever is assessing the quality and strength of expert evidence at whatever stage of criminal proceedings—whether forensic scientists advising police investigators, or prosecutors making decisions about charge or case progression, or defence lawyers advising on plea or devising a trial strategy, or trial judges ruling on evidentiary admissibility, or juries deliberating on their verdicts—the same fundamental precept applies: forensic science and other expert testimony will advance the cause of justice only on condition that the evidence is methodologically robust in its own terms, addressed to legally pertinent issues, and communicated in a way that makes its evidential value for the instant proceedings transparent and intelligible to non-specialists.

Fundamental as they are, these elementary propositions are old news. The ‘top 20’ problems with forensic science evidence summarized in §2 will be entirely familiar to well-informed readers. Nor are we lacking in proposals for reform, many of which have come around on the policy carousel more than once before. Yet, there is considerable institutional resistance to sweeping change; some of the reforms that have been implemented have not had their intended effects (partly owing to cultural adaptations and neutralization, aided and abetted by the law of unintended consequences); and many of the same old problems apparently persist. We have a surfeit of diagnosis, but how much of it is sufficiently well informed about the normative frameworks and institutional



environments of criminal adjudication to serve as a secure basis for intelligent prescription? If the patient keeps rejecting the medicine, or does not improve when remedies are administered, perhaps the initial diagnosis was faulty.

This article has sketched out some of the normative and jurisprudential context of criminal adjudication in England and Wales, with the aim of promoting better understanding of the institutional environment in which forensic science must operate. This environment is normatively, jurisprudentially, epistemologically, sociologically and culturally complex, and any attempt to grapple with it in one short article is obliged to arbitrate between a welter of contextual detail and banal generalities. Sections 3 and 4 were devoted to explaining important institutional facts about legal jurisdiction and the adversarial model of criminal procedure, because non-lawyers often overlook the significance of jurisdictional aspects of positive law (which are too easily dismissed as 'legal technicalities') and adversarialism is too readily blamed for the travails of forensic science evidence, without appreciating the range of factors in play or giving any serious thought to practical alternatives. I do not imagine that the substantive arguments developed here, incomplete and superficial as they are, will win over staunch critics of existing institutional arrangements. My ambitions are more modestly methodological. Specifically, I hope to have shown that statements like 'we need to introduce an inquisitorial system' or 'if only lawyers would think and behave more like scientists' or 'the system should just concentrate on finding the truth' do not even begin to qualify as serious arguments about the reform of criminal adjudication.

Where does this critical diagnosis leave us, in terms of intelligent prescription? I believe that we should focus on ensuring that our existing procedural models operate effectively in practice, possibly with some adaptations to address the particular challenges posed by forensic science evidence, rather than on sweeping procedural reform, which could be tantamount to creating a parallel system of criminal adjudication for cases featuring expert testimony. Adversarial criminal procedure is both truth-conducive in structural design and deeply embedded in British traditions and culture. Adversarialism, however, presupposes that the prosecution's evidential constructions (including those incorporating forensic science evidence) are in principle open to deconstruction through vigorous, well-informed defence cross-examination. Contested trials are essential for keeping guilty pleas honest. One implication is that the defence must have access to high-quality forensic science assistance in deciding on plea and formulating trial strategy. Although this might be characterized as a defence process right, it is, more fundamentally, a system-requirement of adversarial criminal procedure (related to the right to counsel, and part of the more comprehensive right to present a defence). This raises urgent practical questions about the adequacy of legal aid funding and the operation of 'market forensics' in a post-FSS world of cuts and austerity.

The foregoing discussion also gestures in the direction of redoubling concerted efforts, on various fronts, to improve communication between lawyers and scientists and other expert witnesses. Besides enhancing the reception and uses of expert evidence in individual cases, better communication should contribute incrementally to realizing the broader policy objective of promoting genuine, profound mutual understanding and respect for the professional roles and responsibilities assumed by prosecutors, defence lawyers, trial

judges and expert witnesses in our system of criminal adjudication. A greater emphasis on full pre-trial disclosure, clarification of the issues (including points of apparent expert disagreement) and thorough case preparation, as now mandated by the Criminal Procedure Rules, is welcome in this regard. Such measures are not only instrumentally valuable in encouraging well-informed and timely guilty pleas and facilitating more focused and effective trials. Mutual understanding and respect is also vital for sustaining the integrity of forensic science, inasmuch as practitioners' expectations motivate and inform their professional conduct and operational decision-making, which in turn shape the progress and outcomes of criminal investigations, prosecutions and trials. The quality of the administration of criminal justice, in my opinion, turns more on these relatively prosaic, largely unheralded educational and cultural factors than on headline-grabbing grand legislative gestures—which either fail to materialize at all or, if consummated, almost invariably disappoint in their botched enactment or uneven implementation.

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## Endotes

<sup>1</sup>Criminal Procedure Rules 2015, Part 33.

<sup>2</sup>ACPO and CPS, National Streamlined Forensic Reporting Guidance (v. 2.0, 2013), [www.cps.gov.uk/legal/s\\_to\\_u/scientific\\_evidence/](http://www.cps.gov.uk/legal/s_to_u/scientific_evidence/) (accessed 29 January 2015).

<sup>3</sup>Consolidated Criminal Practice Direction, Division V Evidence, 33A (6 October 2014) [13].

<sup>4</sup>This provocative phrase is owed to Peter Huber and is more prominent in US debates concerning expert evidence: see [14–16].

<sup>5</sup>The clue is in the etymology: 'forensic' originally meant 'legal'.

<sup>6</sup>'[S]cientific knowledge is distinguished from other intellectual artefacts of human society by the fact that its contents are sensible. The goal of science, moreover, is to achieve the maximum degree of consensuality. Ideally, the general body of scientific knowledge should consist of facts and principles that are firmly established and accepted without serious doubt by an overwhelming majority of competent, well-informed scientists' [29].

<sup>7</sup>In *Moore v Medley*, *The Times*, 3 February 1955, the Court ruled that membership of the Inner Circle of Magic qualified a witness as 'a highly expert magician'. A more prosaic illustration is *R v Chatwood* [1980] 1 WLR 874, CA (known drug abusers qualified to identify heroin).

<sup>8</sup>Law Commission Consultation Paper No 190, The Admissibility of Expert Evidence in Criminal Proceedings in England and Wales (TSO, 2009), para.6.22.

<sup>9</sup>Law Commission, Expert Evidence in Criminal Proceedings in England and Wales, Law Com No. 325 (TSO, 2011).

<sup>10</sup>Such as English law's general rules excluding improperly obtained evidence, hearsay, extraneous bad character, etc. (all of which have fuzzy boundaries and/or multiple inclusionary exceptions and provisos). For systematic exposition and critical commentary, see [31].

<sup>11</sup>At least if we confine our attention to broadly speaking Western liberal policies. Differences in substantive criminal law become more evident if we extend our comparative analysis to include non-democratic states, such as China, or theocracies like Iran.

<sup>12</sup>This is a convenient analytical concept, but its relationship to real-life legal systems is problematic and its implications are often misunderstood, especially by Anglophones. See further, [36].

<sup>13</sup>Calling for a sophisticated ‘common law comparativism’: see [37].

<sup>14</sup>For some useful entry points into the burgeoning and disparate literature, see [39–43].

<sup>15</sup>*R v Turner* [1975] QB 834, CA; *R v Clarke (Robert Lee)* [1995] 2 Cr App R 425, 429–30, CA; *R v Hurst* [1995] 1 Cr App R 82, CA; *R v Francis* [2013] EWCA Crim 123, [38]–[39].

<sup>16</sup>Decisions are unreasonable (or ‘irrational’) in the *Wednesbury* sense if they fail to take into account relevant considerations, incorporate irrelevant considerations, or arrive at a conclusion that no reasonable decision-maker, properly appraising salient facts, could have reached. Judicial review ensures that so-called ‘discretionary’ decisions are actually an exercise of judgement by the appropriate decision-maker.

<sup>17</sup>*R v Silverlock* [1894] 2 QB 766, CCR.

<sup>18</sup>*R v Luttrell* [2004] 2 Cr App R 31, CA.

<sup>19</sup>As the Court of Appeal observed in *R v Smith (Peter)* [2011] 2 Cr App R 16, [2011] EWCA Crim 1296 (querying the apparently ‘closed shop’ arrangements for training fingerprint examiners in the UK).

<sup>20</sup>Or no more: primary legislation, no less than ‘soft law’ norms and ethical standards, can be neutralized or circumvented in practice, if practitioners have a mind to, perhaps because they believe that the law, or its underlying policy rationale, is misconceived or not fit for purpose.

<sup>21</sup>*R v Harris*; *R v Rock*; *R v Cherry*; *R v Faulder* [2006] 1 Cr App R 5, [267]–[274]; *R v B(T)* [2006] 2 Cr App R 3, [174]–[178].

<sup>22</sup>Criminal Procedure Rules, r.33.2. Also now see Forensic Science Regulator, Information—Legal Obligations, FSR-1–400 (2015).

<sup>23</sup>This is certainly conceivable, but only in a science fiction world of omniscience or infallible precognition. Cf *The Minority Report*,

where even the supposedly infallible precogs turn out to make mistakes.

<sup>24</sup>As the Grand Chamber of the ECtHR summarized in *Edwards and Lewis v United Kingdom* (2005) 40 EHRR 24, [55]: ‘It is in any event a fundamental aspect of the right to a fair trial that criminal proceedings, including the elements of such proceedings which relate to procedure, should be adversarial and that there should be equality of arms between the prosecution and defence’. Generally, see [67].

<sup>25</sup>See e.g. [70] (observing that, ‘[j]udges may be inclined to give too much weight to expert testimony and forensic evidence (especially true of DNA)... [I]t is perhaps more problematic that judges will generally have at their disposal the evidence of only one expert. [T]he routine absence of an expert for the defence means that the court is dependent upon its own, often amateur, evaluation of the evidence’) [71].

<sup>26</sup>*Davie v Edinburgh Magistrates* [1953] SC 34, 40; applied, e.g., in *R v Gilfoyle* [2001] 2 Cr App R 57, 67, CA; *R v JP* [1999] Crim LR 401 (LEXIS Transcript).

<sup>27</sup>This pernicious misapprehension is reinforced because, unfortunately, partisan opinions sponsored by special interests sometimes masquerade as scientific facts. For a compelling rebuttal, see [79].

<sup>28</sup>Criminal Justice Act 2003, s.44; *R v Twomey* [2009] 2 Cr App R 25; [2009] EWCA Crim 1035.

<sup>29</sup>The Royal Statistical Society has published four thematic Practitioner Guides on this topic: see [www.rss.org.uk/statsandlaw](http://www.rss.org.uk/statsandlaw) (accessed 8 May 2015).

<sup>30</sup>See e.g. *R v Henderson* [2010] EWCA Crim 1269; [2010] 2 Cr App R 24; *R v Cannings* [2004] 2 Cr App R 7, CA.

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