1. Introduction

I address today’s meeting as a guest. I am a guest in the sense that my disciplinary background in sociology separates me from most of today’s participants who are trained in one or several of the natural sciences as well as in the forensic applications of those fields of inquiry. I am trained only in the ways of a single social science, although a science which is intensely ambitious in its efforts to describe and explain what it is that makes social life – of all kinds, in all places and at all levels, from the personal through the institutional and the societal to the global – the varied, complex, but orderly achievement that it is. The inevitable corollary of my own sociological sensibility is that I risk the rejection of this audience with over-eager reminders of the necessity to take note of the ways in which all scientific and technological achievements are profoundly social enterprises whose nature and significance can be understood only by reference to their varied internal histories, and to the wider socio-cultural conceptions and aggregations within which these histories are located.1 However, despite this danger, and our many disciplinary differences, I also like to think that I share sufficient common interests with all others who have chosen to attend this conference to justify my status as invited guest rather than that of an unwelcome stranger.

Amongst these common interests are two in particular. The first, a concern more fully to understand the rationale for, and nature of, the heterogeneous character of forensic science practice and the forces shaping both its routine and exceptional forms. The second, an ambition to specify with increasing accuracy the actual and potential contribution of forensic science to criminal justice processes within the States of the European Union and beyond.

It is my contention that the successful pursuit of these, along with other such, interests depends on the ability of practitioners and researchers to supplement knowledge of natural science substance and reasoning with a range of theoretical considerations and methodological resources drawn from the humanities and the social sciences. We need to be willing to draw on these supplements if we are to analyse properly the character and role of the varying scientific assumptions which underpin forensic science reasoning, and which in turn inform credible and serviceable forensic science practice. We also need such interdisciplinary collaborations to inform the proper scrutiny of the ambitions and achievements of those who promise, develop promote, and deploy, the increasing number of technological innovations that jostle one other for attention in the contemporary forensic agora. Finally, the successful evaluation of the effects (including the effectiveness) of the investigative and judicial uses of forensic practice is impossible without the systematic study of social and organisational aspects of its delivery and use, alongside questions of its scientific adequacy and technological capability.

In responding to the particular theme chosen for this triennial conference, of knowledge exchange, I further assert that academically informed explorations of all of these issues should be designed and carried out in close collaboration with both those who produce and those who use forensic science intelligence and evidence to support the work of criminal investigation, advocacy, and judicial deliberation. Whilst this may seem only to state the obvious, I do it in order to make clear that the successful achievement of these cognitive and practical ambitions requires commitment to a model of knowledge exchange which goes beyond the earlier and popular notions of ‘knowledge transfer’ commonly found in recent work on science and its social and economic uses. Behind such a notion of knowledge transfer lay a model of natural science knowledge and technology development in which University-based fundamental science underpins the dissemination of proven verities to be taken up and ‘applied’ by state and commercial providers of techno-science services and products, subsequently to be consumed by the end-users of these resources.

This now seems an outdated model and, as I shall explain in a moment, I think we need a better understanding of both the push and pull factors which shape current scientific knowledge production, including forensic science knowledge production, knowledge which it is increasingly difficult to categorise as either ‘pure’ or ‘applied’. The work of a small group of scholars who have outlined the lineaments of what they have called ‘Mode 2’ knowledge production, provide insights that we can apply without difficulty to thinking about the kind of social structures and processes that are relevant to the production and consumption of contemporary science and technology in general, and contemporary forensic science and technology in particular.2 The distinctive features of Mode 2 knowledge production are most easily grasped when contrasted with the previously dominant form (Mode 1). This earlier modality was largely based on the existence of long-standing academic disciplines and was achieved largely in elite universities connected with key government agencies without regard to the possibility or relevance of downstream applications by commercial or other actors. Where Mode 1 was disciplinary, Mode 2 is transdisciplinary; where Mode 1 was intellectually, or ‘curiosity’


driven, Mode 2 is problem driven; where the production of Mode 1 knowledge was concentrated in a small number of places, Mode 2 production is more widely distributed; and where Mode 1 producers worked together in relatively stable groups over long periods of time, Mode 2 producers now work together in more transient and more permeable groupings which have much shorter lives. Certainly the specific production of forensic science knowledge and innovation very much resembles the properties of Mode 2 knowledge in general as described by Gibbons and his colleagues.

In addition, when we move to consider not just how forensic techno-science is produced, but how it is used in practice (and how these practical uses do, and should, shape the production of innovations) we need both to draw on and elucidate the explicit and tacit knowledge of forensic service and product providers and consumers, knowledge that has hardly ever been used to inform, or made the subject of, prior academic research on the effectiveness of the deployment of science and technology, especially in the forensic domain. We need to understand how that knowledge is deployed in the selection and utilisation of specific forensic technologies, and we have to take account of the ways in which a variety of kinds of informal and unexplicated mundane cognitive and social resources are used to inform the actions of individuals who carry out field and laboratory forensic science.

2. Shaping technological innovation

Today there circulate countless rhetorical endorsements of the claim that science and technology are constitutive features of contemporary social life. This claim of course has a long history, being an exemplification of a long-term social process of what Max Weber called ‘rationalisation’ in which both traditional and charismatic forms of authority based on convention or revelation, are replaced by reason, calculation and the logically structured pursuit of personal and collective interests. Recent history has, however seen an intensification of this process (visible, for example, in the use of descriptive terms like the ‘knowledge society’) in which cognitive power, especially the cognitive power of scientific reason, is seen as a primary productive resource. Here then science occupies the privileged position accorded to labour and capital as such resources, and accordingly, successful innovation in science and its technological derivatives is seen as the engine of economic activity in advanced industrial societies. In turn, the acceptance of this assertion has given rise to a bewildering number of governmental and other strategies for scientific and technological innovation in a wide variety of social domains from telecommunications to food production.

The application of these ideas to forensic science is visible in several recent documents and programmes of work including the Home Office Science and Innovation Strategy, The United Kingdom Security and Counter-Terrorism Science and Innovation Strategy, and the National Policing Improvement Agency National Police Forensics Strategy. My sociological frame of reference encourages me to pay particular attention to the range of presuppositions, expectations, hopes and fears that inform the production of such strategies as well as to consider the extent to which they successfully shape the activities that they seek to engender. Two recurrent features of such strategies seem especially important to me, and worthy of some brief comments.

The first is that they tend to share – for the reason I have already suggested – an underlying utopian vision of the capacity of science and technology to deliver the economic and social goods thought desirable in contemporary societies. When this vision is applied to the social good of ‘crime control’, then it may be asserted that the successful application of science is capable of increasing the capacity of the police to detect crime, and of the courts to convict offenders. In turn, claims-makers may argue that the certainty of detection will, or does, reduce offending, and as this virtuous cycle is amplified, growing confidence is achieved in the capacity of the state to secure the safety of its citizens. In such instances of scientific, commercial and moral entrepreneurship we find much of sociological interest. At the very least they exemplify the significance of social expectations in the shaping of forensic innovation. As Borup and others have suggested,4 ‘imajinations, expectations and visions’ drive technological innovation by providing anticipated legitimation as well as encouraging the investment of time and money by potential developers, and there is already a body of scholarship which has begun to investigate the workings of such expectations.5 Within that body of work, efforts have been made to examine the ways in which the elaboration of expectations – amongst networks of users, policy makers, investors and producers – is one of the ways in which such networks are formed and their boundaries maintained. Another interest has been in the temporal ordering of expectation, in particular, the common occurrence of ‘alternating cycles of hype and disappointment’, cycles which often become part of the forgotten history of technology promises. Finally, a third focus of interest has been the ways in which expectations vary not over time, but across stakeholders and other aggregates, so that for some actors in the innovation process, technological anomalies, uncertainties and instabilities are easily visible and highly relevant, whilst others may be blind to such uncertainties.

At this point, I can only borrow from these authors some of the questions that they ask about the dynamics of expectations in the hope that by asking them within our common field of interest – forensic science – we can further illuminate the role of these rhetorical resources in shaping significant innovations. In particular we should consider how particular advocates have sought to shape practitioner and user expectations as well as how public expectations have been formed and reformed in the course of the highs and lows of forensic science credibility over recent decades. How have cycles of ‘hype’ and disenchantment been instantiated within particular domains of forensic science? How have the successes and failures of innovation in one domain affected the standing of other domains? We should also think about how the particular configurations of forensic science expectations do or do not fit with those of policing in particular, and of the role of the state in securing social order in general. How does the success of innovations relating to crime detection affect those that relate to other security concerns, and vice versa? How too (following Borup, 2006), should we think of feeding back what we learn from an analysis of existing expectations into the future dynamics of forensic science innovation in order to avoid the worst excesses of the cycles of promise and failure that can disadvantage the reputation of forensic science in general?

The second feature of interest to me is how these kinds of strategic documents imagine any social science contribution to the shaping of the kinds of innovations with which they are concerned. Here the dominant tropes are references to social context (defined often as the social issues and problems to which technological resources and solutions are to be applied), social barriers (as intellectual, organisational or societal

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features which prevent or limit technological success) or ‘errors and bias’ (as non-scientific irritants to the production of truth and objectivity in the application of any particular scientific technique by real individuals in practical contexts). However, the more general possibility — that the sociological investigation of trajectories of innovation may throw light on what innovations succeed and how, as well as how any such innovations are shaped during the course of their introduction — are not considered by the authors of such documents.

While there is insufficient time to describe the details of some studies that have done just this in the examination of the careers of specific forensic technologies, I should at least draw attention to three recent instances of social science scholarship that should be of interest to this audience. Three recent books, by Lynch et al., Aronson, and Gerlach have been especially concerned with how forensic genetic innovations have been shaped by the varying interests and knowledge edges of judicial, commercial, policing, and policy actors. Each study examined the complex and contested trajectories that have marked the last 25 years or so of work in this field. The social and intellectual histories that they provide give a sense of the complexity of how such innovations were shaped by a variety of political, legal, and commercial forces as well as by some unanticipated events. They outline the interplay of judicial, legislative and scientific priorities in the development of these forensic technologies and show they ways in which seeming stabilisation (albeit perhaps temporarily) has been achieved in the deployment and acceptance of these resources. In many ways they provide exemplary instances of what a sociologically informed examination of the forensic science innovation process may offer to those who want to grasp its lineaments.

3. Social and organisational innovation

I have just brieﬂy alluded to some sociological studies which have tried to map the trajectories of particular forensic science innovations. Only by undertaking further such studies of a wider array of forensic disciplines, can we advance beyond the rhetorical imaginings of the various strategies for (forensic) science and innovation to which I have already referred. However, thus far, studies have been limited to two technologies (DNA proﬁling and ﬁngerprint comparison) and largely to an examination of one element in the social process in which generic natural science knowledge comes to shape particular forensic techno-science practices.

To explain what I mean here, it may be useful to offer a comparison with work on the social processes by which medical innovations are shaped and realised. Recent interest in the process of innovation in medical practice has crystallized around the notion of the ‘translation’ of biomedical knowledge into clinical practice. In this domain it has become commonplace to distinguish two different phases of such translations. In the ﬁrst phase, ‘bench’ science is translated into human clinical research, usually via clinical trials, sometimes supplemented by observational studies. The focus of stakeholders at this stage is on the ‘efﬁcacy’ of such innovations — in other words whether or not they are capable of giving the kinds of results they promised, albeit in a closely controlled experimental contexts. It is this phase on which the sociological studies I have referred to earlier have largely focussed, and it is also this phase which has been the target of almost all of the state funding of forensic science research

funnelled through the Research Councils as well as through several important European Union science funding initiatives.

However, contemporary biomedical research also involves a second translational phase, a phase in which innovations in the form of new drugs or other new medical interventions that have been tested in trials, are introduced into clinical practice. As this intricate social process unfolds, questions of the efﬁcacy of interventions and treatments central to the context of clinical trials are replaced by more difﬁcult questions of the effectiveness of their uses in practical circumstances that are more variable and more complex. What a technique or intervention is capable of doing, gives way to considering what users want, what they will accept, and how they will make use of the capabilities presented to them. In medicine this has been characterised by Lawrence W. Green as ‘delivering the right care to the right patient at the right time.’ In a series of inﬂuential papers, Green has done much to clarify the preoccupations of this second phase of translational research. In particular it is concerned with the production of evidence about concrete health practices, focussing on the social dynamics relevant to the ways in which doctors and patients interact with whatever treatment innovations relevant to individual cases become available.

This focus — on how technologies are used in practice, and with what effects on the treatment of patients — can easily be transposed into the forensic context. This simply requires moving on from a consideration of what technologies and techniques can do, to the question of how they are used, by whom, when, and with what effects. It is a matter of identifying who are the relevant practice actors (CSI, SIOs, SSMs, Reporting Ofﬁcers, etc) considering their relevancies, modes of reasoning and the combinatorial tolerances of these features. It is also a matter of examining the range of social and collaborative devices that make it possible to knit together the strands of work carried out by these practitioners in order to see how their differing styles of reasoning and distinct professional habits are brought together in the course of criminal investigations. In particular, what happens in briefs, debriefs, the construction of forensic strategies, the production and reception of expert reports, and so on. Whilst Evett, Jackson and others have already done excellent work on how forensic reasoning should be formulated, expressed and communicated, there have been no empirical studies of the reception and uses of such reasoning by investigators or others involved in the criminal process.

However, if we want to research these kinds of issues in an effort to produce detailed practice-based evidence on the signiﬁcance of forensic science innovations, it is worth raising some methodological questions about how such research might proceed. Following Green again, it seems unhelpful to assume that only experimental or quasi-experimental designs should be deployed for such work. Where such methods have been used (e.g. in Roman et al 2008), The DNA Field Experiment: Cost Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes Washington: Urban Institute), they have barely scratched the organisational surfaces of how achievements like DNA matches are deployed in the course of investigations, let alone how these kinds of intelligence sit alongside a wider repertoire of forensic and other information. Other research methods are necessary if we are to penetrate the gloss of such surfaces — in particular ethnographic studies and comparative case analyses. Only when we use them will we be able to identify the ways in which any forensic practice, established or novel, may have identiﬁed a suspect, eliminated a suspect, suggested a line of inquiry, curtailed a line of inquiry, conﬁrmed or refuted a supposition, established a sequence of

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7 I set aside here the fact that there are many current arguments concerning the credibility of the claims of ﬁngerprint comparison to be based on a secure foundation of scientiﬁc knowledge and practice. Similar arguments can be made (and are made in the recent US NRC Report) about a range of other claims in particular forensic domains.

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events, and so on. And at what point in an inquiry these accomplishments were achieved and what happened when they were.

I have already argued elsewhere that we have to set aside statistical measures of the ‘outputs’ and ‘outcomes’ of forensic work carried out to support criminal investigations. Rather, we need to build up a ‘grammar of forensic investigation’. Such a grammar would outline the repertoire of knowledge, actions and inferential processes that make possible standardised forensic accomplishments and show the ways in which these accomplishments are integrated into a wider investigative process. In particular, it would show how abstract forms of knowledge are embedded within the ‘concerted human reasoning, perception, conduct and communication’ (Coulter 1989: 19) that make up the reality of criminal investigations. An adequate account of these matters would provide an important resource for the future training of investigative staff and for the assessment of the value of different organisational arrangements for the delivery of forensic support. It would help answer more general questions concerning the ways in which applications of forensic technologies are shaped by existing police systems and processes, as well as the ways in which the integration of these technologies is driving change in established crime investigation practices.

4. Conclusion

We are meeting at a time when forensic science is at a crucial point in its history. I know that such a claim is a common one for those giving lectures like this one since it can be used to give the patina of global significance to words that would otherwise be only local in their reach. However, everyone here will know that the recent report of the US National Research Council on behalf of the National Academies of Science Strengthening Forensic Science in the United States: A Path Forward, provides a huge challenge for the future of forensic science. In this sense, the notion of crisis is not a hyperbole. Moreover, the challenge of the report is not only one for the United States, but for all contemporary criminal justice jurisdictions that make use of forensic science to support investigations and prosecutions. The most heavily emphasised feature of the report is the necessity for more and better research on forensic science. For the authors of the report, this seemed largely to mean research on the foundations of forensic science, supplemented in part by work on social factors, where such factors were understood to compromise scientificity by the operation of bias and selectivity. Here I have been arguing that there are grounds for extending their understanding of research to downstream uses of forensic science and technology.

Earlier in this presentation I warned of the possibility that my reiteration of the importance of understanding the social factors that shape the development of scientific knowledge and its technological applications might irritate an audience of natural scientists, at least those members of such an audience who hold firmly to a view of science as a self-sustaining enterprise carried out in a social vacuum by agents with no social attributes. However, I have argued in opposition to such a view that an adequate understanding of the nature and uses of forensic science innovations simultaneously requires, and is capable of furthering, knowledge exchange between a variety of types of agents: academic natural and social scientists, practising forensic scientists, forensic entrepreneurs and other commercial actors, police and judicial users, policy makers, and the like. I believe this view of how we generate adequate understanding resonates with the words of the organisers of this conference who have talked about the ‘cycle of knowledge creation, transfer and application’, where the word ‘cycle’ emphasises the importance of iterated feedback between agents in different parts of the process. Only our collective readiness to enter into such exchanges will enable us to improve our currently limited knowledge of how and when forensic science practice works best — in other words, to construct an evidence-based forensics capable of informing the kinds of policies and strategies that I talked about at the beginning of this presentation. Only this readiness will allow us to get a grip on how forensic science innovation happens and is shaped. Only this readiness will help us explain why it has also sometimes failed to live up to the expectation of ‘speaking truth to justice’ which always has been its central ambition and driving force.

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10 In addition to this report, there exist a series of other similar interrogations of contemporary forensic science policy and practice. In England and Wales, these range from the generic explorations of the Law Commission Consultation Paper The Admissibility of Expert Evidence in Criminal Proceedings in England & Wales: A New Approach to Evidentiary Reliability, through the detailed scientific evaluation of particular forensic techniques as in Caddy et al. A Review of the Science of Low Template DNA Analysis, to the ongoing Public Judicial Inquiry of fingerprint evidence offered in the case of HM Advocate v McKie originally held in 1999.