

Summary of talks at the ESCR Research Opening Seminar: Genetics and Crime: contested boundaries, benefits and risks.

ESCR seminar series on genetics, technology, security and justice: crossing, contesting and comparing boundaries.

Wednesday, 2 December 2015, 12:00-18:00, Room A114, Ellison Building, Northumbria University, Northumberland Road, Newcastle upon Tyne, NE1 8ST

This summary was assembled with the kind help of our speakers and ECR bursary holder Ines Gallala (VUB, Brussels).

SESSION I: FORENSIC GENETICS IN SOCIETY

Forensic Genetics, an operational perspective (Mr. Gary Pugh)

The first part of Mr. Pugh's presentation looks broadly at the landscape of genetic forensics in terms of where we are. It starts off in the early stages with blood grouping, which was used as a means for identification. This was quite rare however. Mr. Pugh then shows the importance that forensic genetics has played since in solving crime through its fundamental shift as a tool for rapid identification.

The second part of the presentation looks towards the future, more specifically into future applications and whether or not there is value in looking at genetic markers that look at specific traits. One of the issues addressed by the speaker is that of translating DNA results into evidence, which is a big and complicated step, and even more challenging when you talk about percentages or the likelihood of trait possession. Another possible future application that has already been tested out, is re-opening cold cases where DNA might uncover new leads. This cold case review (e.g. operation Sapphire) has already led to significant results and is still ongoing.

Scientifically, there is still room for innovation. It would be helpful to be able to determine what kind of trace (blood, saliva, semen) was found based on cell type.

The last idea regarding the future applications is more of an economic nature. Since crime is going down, according to crime statistics, is a greater investment in a diminishing market justified?

Themes and variations in the social life of forensic genetics: credibility, legitimacy and utility (Prof. Robin Williams)

Prof. Williams outlines three recurrent themes in social, legal, ethical commentaries on developments in forensic genetics since the first introduction of these technologies into criminal justice systems in the mid-1980s. The themes are: credibility, legitimacy, and utility.

The theme of credibility is closely related to the Lynch and McNally's notion of 'biolegality'. The talk noted that the history of forensic genetics has been dominated by the biolegal narrative of

the 'gold standard' of forensic genetic practice made possible by strong scientific underpinning and rigorous statistical reasoning. However there has also been a counter-narrative of biological hubris in which claims to certainty have been undermined by recognition of crime scene and laboratory contingencies involving issues of sensitivity, transfer and contamination.

The theme of legitimacy is visible in the universal trajectory of forensic DNA sampling and databasing in which national regimes have become much more inclusive over time. The talk described the political and ethical assertions that have informed this expansion and also raised the coming legitimacy challenges of the emerging interest in the application of Next Generation Sequencing in the forensic context.

Finally the talk reviewed some recent efforts to assess the utility of forensic DNA profiling and databasing, including calls by the Human Genetics Commission for a better understanding of forensic utility in general. The talk concluded by arguing that despite interesting and ambitious studies (for example those funded by the US NIJ), data on the practical utility of many innovations in forensic genetics remain sparse.

SESSION II: CONTEMPORARY AND EMERGING TECHNOLOGIES IN FORENSIC GENETICS

Emerging capabilities for forensic genetic analysis – novel investigative leads and improved profiling data from DNA (Dr. Christopher Phillips)

Dr. Phillips introduces his work, which is focused on the identification of the biogeographical ancestry and certain physical characteristics of contact trace DNA donors. The most common use of forensic DNA is identification through comparison of a reference sample and the profiles found at the crime scene or on exhibits. Recent research, however, has developed new markers that provide information about the donor beyond their identification. This has considerable potential for progressing cold cases, when no database hit or eyewitness description is available to investigators.

Much of the focus of research on extended DNA analysis centres on more markers, better data and increased sensitivity. Every contact trace contains a small amount of DNA material, and the question is how many genetic markers can be obtained from such a contact trace and how can the data be improved to provide a more accurate picture of the donor. With the emerging technology of massively parallel sequencing (MPS), it is now feasible to analyse more markers, generate more data with an equal or even higher sensitivity than the current techniques.

The area of phenotyping: predicting physical characteristics from genetic markers, already provides key information as an investigative tool. Established genetic tests can deduce certain traits, such as early-onset male pattern baldness or eye, hair and skin colour. More recently, research has begun to develop tests to estimate a donor's biological age, using the methylation status of the DNA in markers that have a regular 'clock' of changing methylation with time. An approximate +/- 3.3 year margin of error has been achieved for such tests. Lastly, using graphics technology such as EvoFIT, and evaluating genetic associations between genetic markers and facial dimensions, it is now possible to provide a more realistic reconstruction of a suspect's appearance - refining both photofits and eyewitness descriptions.

At the moment, researchers continue to refine the predictive performance of forensic ancestry and phenotyping tests, while commercial initiatives have begun to offer police genetic tests to

make such predictions - although the statistical basis for the predictions cannot be properly assessed by the forensic community. Therefore commercial versions of new genetic tests are not regulated and their predictive error cannot be measured. A lack of regulation has consequences for the proper consideration of the ethical frameworks, privacy issues and checks and balances that are necessary to ensure sufficient public support for new forensic tests.

'Race', Forensics and the Politics of Prediction (dr. David Skinner)

Dr Skinner is a sociologist of science of technology. He argues that the UK forensic database (NDNAD) has been racialized in a number of different ways: in the over-representation of minorities in the database population; in the classification of all DNA profiles according to 'ethnic appearance'; in the use of profiles for experiments to determine the ethnicity of crime scene DNA; in the monitoring and auditing of the database; and in the focus on race and racism in public debate about the database. This double-edged role of data in monitoring and profiling underlines the slipperiness of 'race' in these processes and the varied systems of categorization at play. As the database grew in size last decade, the issue of racialisation presented a significant challenge to the developing systems of ethico-political governance of the NDNAD. These systems have largely had the effect of neutralizing concerns about systemic disadvantage and discrimination. Direct consideration of institutional racism has largely been displaced or postponed in favour of other ways of discussing ethnicity that at one and same time problematize and utilize data organised using notions of race/ethnicity.

Dr Skinner argues that this analysis may help us understand the likely implications of Third Wave Forensics that infer personal characteristics from crime scene samples either through ancestry markers or prediction of phenotype. Here and elsewhere the use of racialized data take place alongside endemic, on-going expert, public, and policy debates about the ethics, reliability, validity and utility of that data. Experts deploy 'race' and 'ethnicity' while acknowledge that they are deeply flawed 'difficult' concepts which are not fully under their control.

SESSION III: LEGAL AND ETHICAL OVERSIGHT

Current legal issues, and those on the horizon. (Mr. Alastair MacGregor, QC)

The ethical issues that arise in connection with the new technologies, arise in connection with the use of DNA and cellular material from crime scenes. It's increasingly clear that a debate about those issues should start now, in an open and transparent manner, since it would be unfortunate if an effective crime-fighting tool were undermined by the perception that it has been adopted without appropriate oversight, rules and structures.

The introduction of new and stricter rules about the retention of biometrics information has had no demonstrably adverse impact on policing or on the overall effectiveness of the database. Though (in contrast to the position as regards retention) there is relatively little legislation which deals with the ways in which the police can use profiles, non-statutory rules have been introduced as regards one process of obvious relevance to these new emerging technologies. Familial searches for example are only allowed with the specific permission of the National DNA Database Strategy Board. Only 16 such searches were carried out in the 2014/15 financial year and there's nothing that suggests that the public feels that it should be allowed more frequently.

When we look at the issues that arise in connection with the new technologies, specifically phenotyping and so on, philosophical debates about privacy, about the risk of actual or apparent discrimination, about the right to be treated as a citizen and not as a suspect, etc. come to mind. One obvious core issue, however, is that of when those technologies should be used.

To determine when and in what circumstances it should be permissible for these technologies to be used, one must follow the rule of proportionality. The more the information that a technology produces, the more the issues that will arise as regards the processing, retention and disclosure of that information. Cost considerations may not for long mean that these technologies are only used in exceptional cases. Nor can much comfort be derived from the suggestion that they will be used only for investigative/intelligence purposes, particularly when one notes the dangers of tunnel vision, confirmation bias etc.

Issues will also arise in the context of medical conditions, and the cross-searching of medical and other records. It has been suggested that disease prediction should be a no-go area and many in the UK might share that view. There are others, however, who might take a different view; who see no greater or lesser privacy concerns about their medical conditions than about their gender or geographic origins. Medical records have long been seen as enjoying particular protection. But what about records and databases held by, say, the Passport Office or the DVLA? The police might well want to access and search other government databases from which it may be possible to identify an offender. The acceptability of cross-searching of databases, like many other important issues, has yet to be properly addressed or even debated.

It's not hard to identify legal and ethical issues in this context that should be addressed and debated – and this should be done before and not after the police start to use these technologies. It would be very sad if the possibilities offered by these potentially valuable emerging technologies were squandered by a lack of openness and engagement with the public.

Current ethical issues, deliberations & stakeholder, and those emerging (Mr. Chris Hughes)

Mr Hughes reviews some of the ethical issues suggested by next-generation sequencing by reference to four overlapping themes, in way of a first sketch at some of the potential issues which arise from next-generation sequencing.

The first theme is discrimination: disproportionate representation of certain groups on the DNA database has been justified by reference to the nature of recidivism and the disproportionate value of having a database of individuals who have committed offences in detecting perpetrators of future offences. However the DNA database is an index of where the resources of the criminal justice system are deployed. It is important to ensure that obtaining, retaining and processing data is proportionate to the desired outcome of detection and prevention of crime.

Relevance and accuracy, the second theme, sets in at the foundation of data in new technologies. The accumulation of specific genes panels for different characteristics and use for identification to a certain extent suffers from the historic bias in medical research with certain groups and populations over- or underrepresented. The accuracy of the predictions as to external physical characteristics or the broad geographical area of an individual's ancestry can be subject to over-interpretation and without considered use of statistics and evaluation of the

results in the light of the known deficiencies and limitations of the databases with which a sample profile is compared can lead to error due to overenthusiasm.

Thirdly, databasing speaks to issues of bias. If information about a number of Y-STR loci is stored on a database then patrilineal analysis of those on the database could possibly “reinforce views about the alleged prevalence of criminality in certain families” - and it is sometimes argued that this genetic proximity testing could reinforce demographic disparities in the criminal justice system by increasing the probability of arrest and conviction of individuals not on the database that are closely related to those on the database-a database which as I have indicated above is skewed.

The fourth theme is proportionality. The increasing power of genetic analysis enables the production of huge quantities of genetic information about individuals; some of which may directly relate to clinically significant information. The gathering of large quantities of genetic information raises potential conflicts with some of the international instruments with respect to human genetic information and raises questions of the proportionality of information retained and its necessity for the forensic investigation under consideration.

As the technology decisively shifts from “identity” to “intelligence,” the complexities and uncertainties mount in terms of what may be achievable. The issue of the extent to which we construct virtual family trees within databases, the interaction with issues around nationality, geographic origin and ancestry, the reliability and predictive value of what is discovered, the impact on police investigations, the extent to which data may actually have some clinical significance and therefore tell something more than just the intrinsic “this is Mr X and non-one else” which has been the model so far, and so therefore the extent to which the conventions on bioethics need to be considered, is underpinned by questions of proportionality and of public acceptance and understanding.

To the extent that stakeholders do not comment and participate, they fall away from the process and the decision-making around forensic genetics becomes more routine and predictable. The discussion around race and the NDNA database has over the last few years been considerably less prominent; the explicit move towards intelligence driven forensic genetics is likely to bring this back to the force.

However issues around identity and the database have recently played out in an intriguing way. The use of databases to establish the identity of possible criminals became a pawn in another conflict around identity. The withdrawal from the Prum arrangements and the subsequent decision to recommend to Parliament that the UK return to them appears to have been significantly driven by concerns about a “British identity” and a “British” way of doing things which was under existential threat from “the other” – in this case justice systems and databases which are as rigorous and respectful of rights as those in the UK but which are “European”. The sense of crisis over British identity pervading or put forward by some politicians and elements of the press used Prum as a symbol. The decision to re-join may be interpreted as a step towards a critical and positive rather than a fearful engagement with that other. How forensic genetics is used and interpreted in discussions of the other, whether in terms of borders or counter-terrorism and how those uses are explained to the public present challenges for the future.