EDITORIAL

Genomics and Criminal Law

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The intersection between criminal law and genomics is an ongoing and exciting one. Perhaps, more so than other areas of scientific innovation, genetic research when applied to criminal law often comes head to head with established precedent, a myriad of statutes and long held ethical convictions and beliefs. In essence, it provides a practical, and in some sense, real-time example of the ethical legal and social implications (ELSI) of new and emerging technologies.

Criminal law and genomics meet at a number of different intersections. Perhaps, most famously, due to police procedural television, in the use of the FBI's CODIS marker system to bank individual unique DNA 'fingerprints' that can be cross-referenced against DNA evidence left at crime scenes. The use of unique DNA sequences to identify individuals raises a number of non-trivial concerns, including, but not limited to: the right against unlawful search and seizure, and particularly how discarded DNA fits within that paradigm; DNA dragnets that look to find individuals that at least partially match crime scene DNA to sweep up innocent relatives and others; concerns with long-term biobanking of DNA samples and the fear that without proper guidelines it may be later misused; and fears that the current non-coding DNA that is used as CODIS markers may one day be found to be markers for actionable, functional or otherwise not simply identifying data.

Other ELSI areas include the growing and successful use of DNA exoneration techniques and related concerns of social justice, both in reflecting on the sheer number of convicted individuals that have been found wholly innocent as a result of new DNA analyses, but also in terms of the accessibility of convicted criminals to what could be expensive analyses and any rights they may have to obtain access to potentially exonerating DNA during an appeal.

Perhaps, one of the most ethically troubling areas at the overlap between genetics and criminal law lies at the use of genetics to infer phenotypes. In some instances, these phenotypes are the more benign visible features such as hair color, eye color, and/or height, among other traits. It becomes more problematic however, when those traits are behavioral.

For example, researchers have found a link between two specific genes and a person's propensity to commit a violent crime; one study involved analysis of almost 900 criminals in Finland. According to the research, two genes: MAOA and CDH13, appear in the genomes of at least 5-10% of all violent offenders in Finland.

Although the research findings are significant in revealing that genetics arguably may take an important role in violent behavior, many scientists are nevertheless warning the public against labeling these genes as "crime genes". In particular, some researchers argue that genetic profiling should not yet be used in criminal courts, for example, in order to reduce sentences.

Many aspects described above are included in the excellent papers in this special issue.

In general, this special issue aims to provide recent research from around the world as it relates to the intersection of criminal law and genomics. To this end, 9 papers are presented herein by authors on various topics representing various legal jurisdictions.

Professor Joh examines the ever expanding use of DNA collection in felony and likely even misdemeanor arrests, an issue not only in the US where the Supreme Court has upheld such practices, but internationally as well.

And, with the growing trend to incorporate behavioral genetics into justice systems alluded to the above, Professor Berryessa surveys how the determination of a genetic basis for pedophilia, a scientific endeavor still in its early stages, will change the way society in general and the justice system in particular, deals with and manages pedophilia, and how newly discovered correlations may influence the justice system vis a vis the treatment and punishment of pedophiles.

Professor Katsanis *et al*., present their study, which combined the use of DNA for use in investigating cases of human trafficking. Their investigation, highlighted, among other concerns, issues and fears relating to the police collection of DNA samples, even for the ostensibly positive usage of investigating cases of human trafficking.

Professor Soleto looks at the fine line that is often crossed in criminal procedure when balancing basic and fundamental human rights against the powerful and very useful DNA technologies in capturing and convicting criminals. In the paper, Professor Soleto argues that many of the real concerns can be dealt with if legislation can be drafted that takes the issues into account.

Professor Williams *et al*., discuss the role of scientists as important contributors to the necessary anticipatory governance for the growing role of genomics in criminal law.

Professors Maclean and Lamparello describe the exciting emerging technology of forensic DNA phenotyping that allows police and others to discern externally visible characteristics from DNA data alone. MacLean and Lamparello suggest that the

scientific community has a responsibility to help promulgate anticipatory legislation taking into account the reasonable uses and limits of the technology.

Professor Beaver *et al*. examine, how in light of the growing acceptance of behavioral genetics in many areas of criminal law, particularly sentencing, the science can also be effective in offender rehabilitation and in the limiting of recidivism.

Professors Gavaghan and Bastan also investigate issues relating to behavioral genetics, particularly the reduction of sentences based on genetic information. The authors aim to show that the incorporation of behavioral genetics into criminal defenses doesn't necessarily challenge central ideas of blame and responsibility within the criminal justice system.

And last but not the least, Professor Fiodorova provides an extensive and detailed look at a pan-European model for the collection of DNA evidence and biobanking of that evidence within the European legal system.

While the intersection between genomics and criminal law has been and will continue to be an exciting field, genomics isn't the only intersection between new and innovative research and criminal laws. Just like genetics was the subject to intense government funded research in the past decades, more recently, some governments, including the US government, have expressed interest in mapping the human brain to try and begin to understand the complex and intricate interactions between neurons.

In a potentially interesting possibility at the intersection between neuroscience and criminal law, neurofeedback technology can be used in the brain to computer interfaces (BCIs). Its imaginable that we could soon see case law wherein pre-conscious thought or BCI misclassifications of user mental states, results in a neuro-controlled prosthetic acting in advance of the conscious to commit an unintended crime.

With mens rea (criminal intent) at the basis of much of our understanding of criminal culpability, these new technologies will present instances wherein the mens rea is either absent or unconnected to the actus reus (criminal act), or when the mens rea alone results in a criminal outcome without an actual actus reus – i.e., through BCI and a remote disconnected device.

In the newly established Zvi Meitar Institute for Legal Implications of Emerging Technologies, at the Radzyner Law School, Interdisciplinary Center, in Herzliya Israel, we are keen to examine not only the intersection between criminal law and genomics, and between neuroscience and genomics, but also the ethical legal and social implications of all areas of new and emerging science and technologies. As many of the authors allude to, it is imperative that these issues be examined early on in the development and introduction of the innovations, such that regulations, if necessary, can be developed to both properly promote that innovation and thoughtfully incorporate it into society.

Guest Editor: Recent Advances in DNA and Gene Sequences
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