Conference "Law and Neuroscience"
Abstracts Key Note Addresses

Professor Avshalom Caspi & Professor Terri Moffitt
Department of Psychology and Neuroscience, Duke University, US
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Genetic vulnerability to the social causes of criminal offending

Crime and violence are major challenges for courts, law enforcement and public health, and antisocial behaviour is the most frequent reason that young children are referred for treatment. For other similarly serious problems of human behaviour, such as Alzheimer's Disease, Schizophrenia, and Alcoholism, genetic research has become highly valued. In contrast, criminology has ignored, or even rejected, genetic research.

Meanwhile, behavioural-genetics research has been undergoing a quiet revolution, and new findings may prove to be a pleasant surprise. More than 100 large-scale studies of twins and adoptees have now investigated the relative genetic and environmental components in the etiology of antisocial behaviours. Of special interest, these behavioural-genetic studies of antisocial behavior provide strong evidence that young people's environments do matter. However, this lecture will go beyond a focus on old-fashioned population-wide heritability estimates, to present the newest wave of behavioural-genetic research into interactions between criminogenic environments and specific genes. This new wave of research has built powerful evidence against genetic determinism. The talk will acquaint listeners with the strengths and weaknesses of recent innovations in genetic research, including how genes fit into the neuroscience of crime. The lecture aims to promote critical thinking about genes and crime.

Dr. Lisa Claydon
Criminal Justice Unit, Bristol Law School, University of the West of England, UK

Criminal responsibility, excuses and the relevance of neuroscientific research

Much has been written about the advances in neuroscience and the broader understanding of what this may or may not mean for our understanding of what it means to be a responsible agent. This paper seeks to examine some of the issues raised by the advances in neuroscientific understanding and the arguments which have been made relating mental states to responsibility for actions.

It concentrates on two particular means of attributing agent culpability in English criminal law. The first is the requirement that the agent's actions should be voluntary and the second is the recognition of certain excuses which discharge or mitigate blame.

Professor Michael Freeman, fba
Faculty of Law, University College, London, UK

Is Neuroscience Law's Magic Bullet?

My presentation will examine the uses and abuses of neuroscience in litigation, particularly in criminal trials. There will be a critical discussion of fMRI, its uses and limits, and a discussion of the case law. Possible future uses will also be examined.

Professor Peter Kinderman
Department of Clinical Psychiatry, University of Liverpool, UK

The legal and social implications of a psychological model of mental disorder

The past few years have seen major developments in our scientific understanding of mental health and psychological well-being. These include significant advances in neuroscience, but also highly significant progress in psychological science and practice. Psychological models of mental disorders are now commonplace, and increasingly integrated with biological or neurological models. Psychological therapies are now the treatments-of-choice for a wide range of disorders and are included in the clinical guidelines for most others.

The mediating psychological processes model suggests that disruption or dysfunction in psychological processes is a final common pathway in the development of mental disorder. The model proposes that biological, social and circumstantial factors lead to mental disorder, crime and other social problems through their conjoint effects in influencing or disrupting relevant psychological processes.

In this paper, I will discuss the implications of a psychological perspective such as this for legal systems. I will argue that models such as this are increasingly likely to be dominant in Western and particularly European healthcare systems, and imply that a dimensional, rather than categorical, diagnostic approach is valid. I will suggest that such models imply no clear distinction between ‘abnormality’ and ‘normality’, and require a re-examination of professional hierarchies and responsibilities. I shall also argue that such models imply a specific approach towards assessing both capacity and responsibility – examining the degree of disruption of key psychological processes resulting from internal and external agents.

Professor Matthias Mahlmann
Faculty of Law, University of Zürich, CH

Perspectives and Pitfalls - Cognitive Science and the Law

The paper will discuss some research projects that approach the understanding of the law in the wider framework of cognitive science. Special attention will be paid to recent studies of neuroethics and their application to legal systems, including new forms of emotivism and their mentalist alternatives. In the light of these discussions, some wider social consequences of the cognitive sciences for the legal culture will be assessed that are for some observers revolutionizing the understanding of one of the most vital institutions of the social world.

Professor Hans J. Markowitsch
Physiological Psychology, University of Bielefeld, DE

Possible consequences of neuroscientific investigations on the legal system

The idea to search for relations between delinquent behavior and peculiarities of the nervous and genetic systems has a long tradition and is related to the general idea that brain and genetics determine our thoughts and actions: Lombroso was among the first who proposed that brain and body features of criminals deviate from those of non-criminals. His ideas were followed-up by the phrenologists and thereafter intensely criticized by scientists in the 20th century. Nevertheless, sporadic research with respect to special or unusual features in the brains of eminent personalities such as Albert Einstein appeared even recently. An intensive new search for such relations started, however, only after sophisticated neuroimaging techniques became available. These methods resulted in finding numerous deviances in delinquents such as murderers or pedophiles. Furthermore, genetic variances were found to be related to levels of aggression, and it was established that biochemical interventions or direct electrical brain stimulation altered behavior in a predictable way. On the other hand, much evidence accumulated demonstrating life-long direct influences of environmental stimulation on neuronal connections. The social raising of children was found to have a major impact on their likeliness to subsequently behave normal or deviant. This kind of research also rose or revived the question of the existence of free will or determinism with respect to human behavior. Practical as well as theoretical implications of these findings will be discussed.

Professor Tomas Paus
Department of Psychology and Mental Health, Nottingham University, UK

Imaging Adolescent Brain: Causes and Consequences

Structural and functional neuroimaging provides a powerful tool for the study of brain maturation and cognitive development during adolescence. But one needs to be cautious about the meaning of "brain images" and avoid confusing a manifestation with a cause. Observing a difference between children and adolescents in the size (or "activation") of a particular structure simply points to a possible neural mechanism mediating the effect of age on a given behavior; it is not the "cause" of this behaviour. Imaging-based assessment should be viewed in the same way as any other quantitative phenotype describing cognitive, emotional, endocrine or physiological characteristics of an individual. To look for causes of a given behaviour and its higher or lower probability during adolescence, we need to turn our attention to the individual's environment and his/her genes. I will discuss these and other issues in the context of our work on environmental and genetic underpinnings of drug experimentation during adolescence.

Dr. Andreas Roepstorff & Dr. Kamila Ewa Sip
Center of Functionally Integrative Neuroscience, Aarhus University, DK

When a lie is not a lie – Neuroimaging of deception in social interaction and lie-detection

The main focus of this talk is to draw a framework in which one should think about deception and brain imaging. Several central issues are addressed throughout this talk:

1) a characterisation of deception, which accounts for fundamental aspects of this social act;
2) the discussion of the production and detection of deception;
3) the discussion of current problems with the neuroimaging of deception, and the potential application of brain imaging as a lie-detection technique.

We argue that the application of neuroimaging to forensic settings is premature, as neuroimaging studies that attempted to examine deception, have not yet produced reliable results. This argument is founded on two fundamental premises: 1) deception should not be restricted to statements of falsehood, because telling the truth can be equally deceptive, depending on the beliefs and intentions of the deceiver, and 2) an act of stating a falsehood in response to precise instructions to do so in experimental settings, is not voluntarily attempted, and thus cannot be classified as deception.

Professor Sir Michael Rutter
Institute of Psychiatry, University College London, UK

The neurogenetics of crime and impulsivity

Antisocial behaviour has an overall heritability of about 50%, together with evidence of various forms of gene-environment interdependence. Environmentally mediated causal effects persist beyond the period of risk exposure. Genes 'get outside the skin' (through genetic effects on both risk exposure and risk susceptibility) and environments 'get inside the skin' (through effects on biology, including neural structure and gene expression). There is important heterogeneity in antisocial behaviour – with heritability being higher in the case of that associated with psychopathy or ADHD, with different biological pathways. Some forms of antisocial behaviour are associated with impulsivity and these varieties have features in common with suicide.

Key findings on neural structure and functioning (as shown by brain imaging), on neurophysiology and neuroendocrinology will be considered. There are important differences between antisocial individuals and normals, but almost all the data concern cross-sectional, case-control differences – with the inevitable uncertainty as to whether they represent cause or effect. Molecular genetic findings show GxE, with effects that are relatively diagnosis-specific. Experimental approaches using intermediate phenotypes and combining molecular genetics with imaging are particularly emphasised.

The main research messages will be summarised, and brief mention made of possible implications for the law.

Professor Amedeo Santosuosso
Milan court of appeals; Chair of Constitutional Law, State University of Milan, IT

Neuroscience and individual boundaries

When neuroscience advances are discussed in legal contexts, the first reaction is to wonder if free will and the legal notion of accountability are undermined. However this way of reasoning is neither exhaustive, in theoretical terms, nor productive in order to face the new reality. A provisional not exhaustive survey of the neuroscience applications on human body includes:

- Brain-machine-web connections and the realization of cyborgs are no longer futuristic issues;
- Scientific methods of selection may be used by schools or by firms using brain-scanning tests;
- The brain of people under stress might be improved (e.g. drugs as Provigil or Ritalin);
- The new neuroscientific technologies may now undermine the concept of brain death.

Thus the impact of neuroscience is wider than usually considered.

The neuro-induced redefinition of the biological and mental boundaries of the individual gains the priority, and the same question of free will may not be at the forefront any longer. We may discover that individual's will is intertwined with wills of other persons. Should we move from the concept of *individual (free) will* toward *association's (free) will*?

Dr. Thomas Scheffer
Director of the Emmy-Noether group "Comparative micro-sociology of criminal procedures" at the Free University Berlin, DE

Demonstrating (free) will in law

Criminal law-in-action provides a whole set of methods to demonstrate intentionality and responsibility. The paper analyses the methods to demonstrate and to test 'bad intention' in English jury trials, meaning in Crown Courts. It does so in three cases of assault. The methods used by lawyers can be characterised by a number of patterns, namely the burden of proof for a willful act (not the presumption), a focus on extended chains of acts (not on single acts), and the choice between variations of intentional states (not one universal conception). The legal methods to demonstrate (limited) responsibility are not congruent with the neuroscientific critique of humanist subjectivism and social scientific action theory. This is why the general neuroscientific findings are of limited use for the fact-finding in criminal courts.

Professor Roger Smith
Department of History, Lancaster University, UK; Institute of the History of Science and Technology, Moscow; Institute of Psychology of the Russian Academy of Sciences, Moscow, RU (emeritus)

Does new knowledge make a difference? Reflections on the history of science-law relations.

It would seem self-evident: new knowledge requires new social practices. Yet there is reason and historical example to suggest that there are situations in which it is not self-evident at all. In any society, there are institutions with different purposes, and the kind of knowledge which may be appropriate in one setting may not be in another. Many scientists appear at least tacitly to believe, however, that the kind of knowledge which they produce must change all aspects of human life because it gets to the 'real' causes of events.

Medical men began in the first half of the nineteenth century to claim that new knowledge of the brain requires both legal changes and new human self-understanding. There was, for example, vociferous debate about the insanity defence. The outcome was not so much recognition of the truth of new knowledge as new administrative arrangements (like pre-trial assessment), new occupations (like that of the medico-legal expert) and new regulative bureaucracies (as for foodstuffs or drugs). It began to be clear that if, in principle, the brain is the substrate of all human activity, then knowledge of the brain may help differentiate different kinds of activity (such as illness) but will not help society decide what social response is appropriate to which kind of conduct. Participants in debates also began to distinguish general questions about the relations of law and science from particular claims about the capacity of new technologies (e.g. in relation to witness evidence or fingerprinting) to arbitrate specific legal or social decisions.

I shall explore these points and trace some historical examples which appear very close to contemporary debates. Nobody will doubt that there is new knowledge in neuroscience in recent decades. But in what ways does this new knowledge break the historical pattern?

Professor Cheryl Thomas
Centre for Empirical Legal Studies, University College London, UK

Inside the Judicial Mind

Neuroscience's exploration of the judicial decision-making process is only in its embryonic stages. In this talk, I will explore what we already know and what we don't know about the process of judicial decision-making. The disciplines of political science and psychology have advanced our understanding

of how judges and juries make decisions and have also highlighted important pitfalls to be avoided in this field. This talk explores the crucial lessons for neuroscience from the substantial body of research on the judicial decision-making process that exists in these other disciplines. It explores 3 crucial questions than need to be addressed in attempting to explore what goes on inside the judicial mind:

1. Who is doing the judging? How does decision-making by professional judicial decision-makers (judges) differ from judicial decision-making by lay persons with no legal training (jurors)?
2. What is the decision? This explores how crucial the type of decision is in studying the process of judicial decision-making (e.g., how does determining guilt and innocence differ from sentencing and awarding damages?)
3. Are judges gods? Do professional judges have any special claim to impartiality?