



RESEARCH CONFERENCES

ESF-COST High-Level Research Conference Law and Neuroscience: Our Growing Understanding of the Human Brain and its Impact on our Legal System

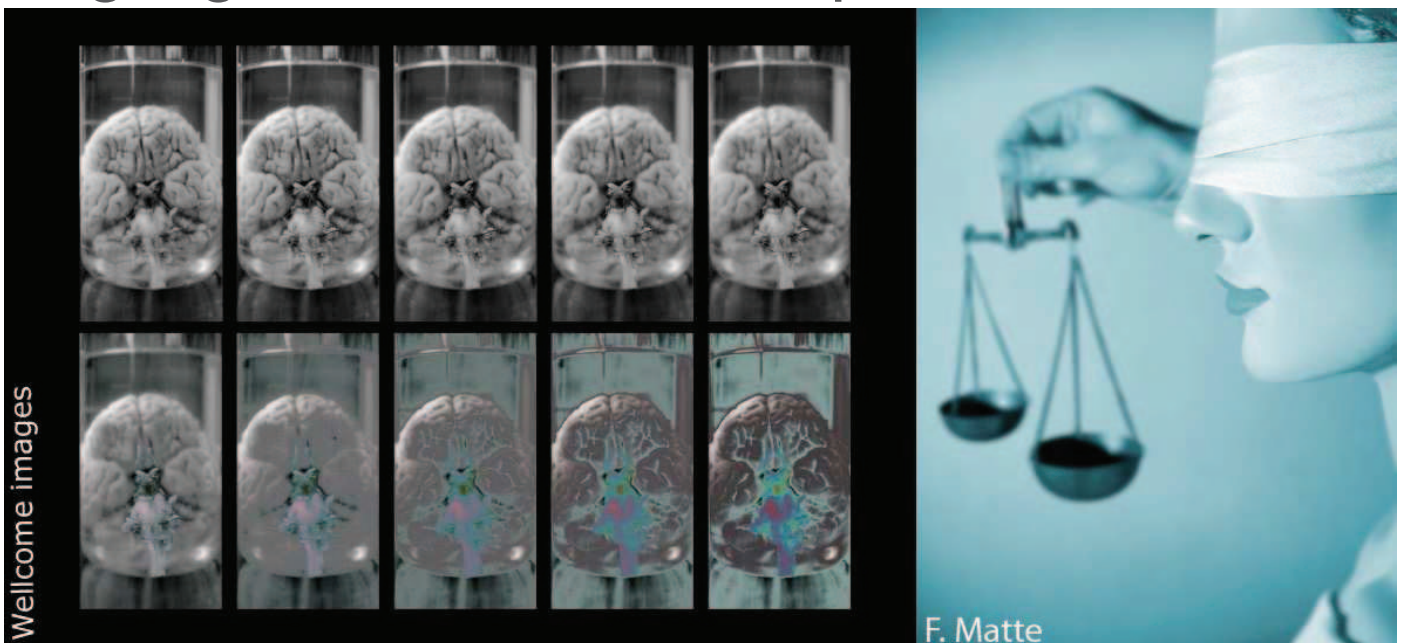
Hotel Villa del Mare, Acquafredda di Maratea • Italy
26 – 31 October 2009

Chair: **Nikolas Rose**, London School of Economics, UK

Programme Committee: **Berry J. Bonenkamp**, Netherlands Organisation for Scientific Research, NL, **Caitlin Connors**, BIOS Research Centre, UK, **Giovanni Frazzetto**, BIOS Research Centre, UK, **Kenneth Hugdahl**, University of Bergen, NO, **Eva Hoogland**, European Science Foundation, FR, **Julia Stamm**, COST, BE

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Highlights & Scientific Report



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Conference Highlights

Please provide a brief summary of the conference and its highlights in non-specialist terms (especially for highly technical subjects) for communication and publicity purposes. (ca. 400-500 words)

In the past two decades, the field of neuroscience has made significant progress in understanding many aspects of human brain functioning. Many expect that this research will make further strides over the next decade. And many suggest that this knowledge could have a profound impact on the future of our legal system and legal practice. There has been much speculation over whether developments in neuroscience will overturn legal paradigms (e.g., by shattering the concept of free will). This conference aimed to sidestep such speculations to address empirical evidence and current research on the likely impacts of neuroscience on legal practice, with a specific focus on European legal systems.

Topics that were addressed included

- The troubled history of the relations between legal systems and the 'positive sciences' of psychology and psychiatry, and the lessons of that history for today;
- The promises and pitfalls of neuroimaging, and the current state of knowledge about the use of imaging technologies to identify features of brain structure and function which have legal relevance;
- The promises and weaknesses of claims to have developed accurate neuroscience-based lie detectors and the evidence as to the current and likely future role of lie detection technologies in the criminal justice system;
- The potential for neuroscience to assist the courts in determining competencies and legal capacities in the area criminal responsibility and other areas of law;
- The current state of knowledge in behavioural genetics of anti-social behaviour, and its potential applications in policy and practice, within and outside the criminal justice system.
- The role of neuroscientists as expert witnesses in the courtroom, and the criteria which courts use, and should use in the future, for determining the admissibility of neuroscientific evidence.

The conference established a dialogue between neuroscientists, legal practitioners, researchers in socio-legal studies and social scientists, furthered mutual understanding and made some realistic evaluations of the potential developments at the intersection of neuroscience and law. It became clear that there was a lack of empirical evidence from across Europe as to the actual usage of neuroscientific evidence in the courtroom, to enable a comparative evaluation within Europe and between Europe and other regions, and ***the conference called for the development of such an empirical knowledge base.***

Further, the conference expressed concern at the way in which such evidence had been introduced in some cases, and identified considerable variations between jurisdictions on the admissibility and use of neuroscientific evidence in the criminal justice system. Participants agreed that neuroscientific evidence, where carefully presented by an expert who had full knowledge of strengths and weaknesses, acting impartially, could sometimes contribute usefully to such proceedings, but that it never spoke for itself and must always be considered alongside other evidence in making a determination.

The conference called for clear guidelines to be established and promulgated on this issue, to avoid misleading and premature uses of early findings from basic research in criminal trials and other legal forums.

The conference commended, in particular, the criteria set out in the 2009 publication by the UK Law Commission (Consultation Paper No 190) on the Admissibility of Expert Evidence in Criminal Proceedings in England and Wales.

The conference also called for more attention to be given to the uses of neuroscientific evidence and assessments outside the arena of the courtroom, and expressed some concern about the apparent lack of regulation in these areas.

X I hereby authorize ESF – and the conference partners to use the information contained in the above section on 'Conference Highlights' in their communication on the scheme.

Scientific Report

Executive Summary

(2 pages max)

- In the past two decades, the field of neuroscience has made significant progress in understanding many aspects of human brain functioning. This conference aimed to address empirical evidence and current research on the likely impacts of neuroscience on legal practice, with a specific focus on European legal systems.
- Topics that were addressed included
 - The troubled history of the relations between legal systems and the ‘positive sciences’ of psychology and psychiatry, and the lessons of that history for today;
 - The promises and pitfalls of neuroimaging, and the current state of knowledge about the use of imaging technologies to identify features of brain structure and function which have legal relevance;
 - The promises and weaknesses of claims to have developed accurate neuroscience-based lie detectors and the evidence as to the current and likely future role of lie detection technologies in the criminal justice system;
 - The potential for neuroscience to assist the courts in determining competencies and legal capacities in the area criminal responsibility and other areas of law;
 - The current state of knowledge in behavioural genetics of anti-social behaviour, and its potential applications in policy and practice, within and outside the criminal justice system.
 - The role of neuroscientists as expert witnesses in the courtroom, and the criteria which courts use, and should use in the future, for determining the admissibility of neuroscientific evidence.
- One highlight of the conference was the presence of a substantial number of early career researchers, and a successful early career researchers forum explored the necessity for, and the potential for interdisciplinary collaborative research on the relations between neuroscience and the law. In particular they discussed the main challenges (epistemic, experimental, regulatory) for a successful interaction between law and neuroscience, explored different views on the most society-sensitive or pressing questions to address through such an interaction, and discussed possible experimental and research proposals that might embody such collaboration.
- The conference established a dialogue between neuroscientists, legal practitioners, researchers in socio-legal studies and social scientists at different stages of their careers, furthered mutual understanding and made some realistic evaluations of the potential developments at the intersection of neuroscience and law.
- It became clear that there was a lack of empirical evidence from across Europe as to the actual usage of neuroscientific evidence in the courtroom, to enable a comparative evaluation within Europe and between Europe and other regions, and ***the conference called for the development of such an empirical knowledge base.***
- Further, the conference expressed concern at the way in which such evidence had been introduced in some cases, and identified considerable variations between jurisdictions on the admissibility and use of neuroscientific evidence in the criminal justice system. Participants agreed that neuroscientific evidence, where carefully presented by an expert who had full knowledge of strengths and weaknesses, acting impartially, could sometimes contribute usefully to such proceedings, but that it never spoke for itself and must always be considered alongside other evidence in making a determination. The conference called for clear guidelines to be established and promulgated on this issue, to avoid misleading and premature uses of early findings from basic research in criminal trials and other legal forums.

- The conference commended, in particular, the criteria set out in the 2009 publication by the UK Law Commission (Consultation Paper No 190) on the Admissibility of Expert Evidence in Criminal Proceedings in England and Wales. The conference also called for more attention to be given to the uses of neuroscientific evidence and assessments outside the arena of the courtroom, and expressed some concern about the apparent lack of regulation in these areas.

Scientific Content of the Conference

(1 page min.)

- *Summary of the conference sessions focusing on the scientific highlights*
- *Assessment of the results and their potential impact on future research or applications*

Nikolas Rose (Martin White Professor of Sociology and Director of the BIOS Research Centre, London School of Economics and Political Science, Chair of the European Neuroscience and Society Network and Chair of the Scientific Committee) opened the conference by setting the scene, and in particular emphasized the aim of the conference – to initiate a debate based on empirical evidence of the ways in which neuroscientific evidence is being taken up in the criminal justice system in Europe, and to be based on the real state of the art of empirical evidence from neurobiology, in contrast to the US focus of much of the current debate, and the tendency to speculate about future uses rather than base arguments on empirical evidence of actual practices. He also expressed the wish that the debate would be placed in its social and historical context, and take cognizance of what we have learned from the relation between legal practices and processes and previous developments in the ‘positive sciences’ such as psychology and sociology. And he asked whether one of the most significant mutations that we might observe would be a slow transformation in conceptions of the nature of human beings, that would gradually shape the everyday perceptions of actors in legal practices.

Roger Smith (Emeritus Professor at Lancaster University, United Kingdom and Institute for the History of Science and Technology, Moscow, Russia) gave the opening keynote on the question “Does new knowledge make a difference? Reflections on the history of science-law relations”. He examined some of the key moments in this relation, and argued that beliefs about the novelty of the role that neuroscientific evidence might play today are overstated. He showed that the key determinants of the accommodation between the courts and psy experts have come from policy changes – for example, the abolition of capital punishment decreasing the emotive dimension of the debate, the diminution of the sharp divide between sanity and madness with the introduction of defences of infanticide and diminished responsibility, and the development of the occupation of the medico-legal expert from the late nineteenth century. He considered the differences between the role of the expert in inquisitorial and adversarial legal systems, and argued that many cases of introduction of expert evidence into the courts came as a result of legal ‘pull’ rather than scientific ‘push’. This led to a debate about how to understand the dynamics of this relation today, where neuroscientist ‘entrepreneurs’ are seeking to make themselves relevant to legal practices.

Mathias Mahlmann (Professor and Chair of Legal Theory, Legal Sociology, and International Public Law, Universität Zürich, Switzerland) presented on “Perspectives and Pitfalls - Cognitive Science and the Law”. He outlined the key areas of neurolaw – forensic uses concerning impairment of responsibility, bias in judges and questions of witness memory and defendant credibility, and argued for the importance of legal reasoning considering the cognitive elements and neurophysiological basis of moral judgments. He put forward a mental theory of ethics and the law, involving a generative moral faculty, with a universal moral grammar that was foundational for moral codes. He also considered the socio-cultural implications, including the consequences for the self images of human beings, but concluded that neuroscience would not erode the fundamental questions of freedom of the will and the reality of choice.

Amadeo Santosuosso (Milan court of appeals and Professor at the University of Pavia, Italy) gave a presentation on “Neuroscience and individual boundaries”, outlining some issues in the history of the Italian Penal Code and the tension between ideas of free will, retribution and social defence, and the question of the cognitive abilities necessary to be a citizen. He raised some issues about the role of court appointed experts and raised the very recent case (October 2009) of an Algerian defendant convicted of homicide, but given a reduced sentence on the basis of a genetic defence involving evidence of a genetic variation

leading to a low acting version of the enzyme Monoamine Oxidase A (MAOA). This led to a debate on the question of the admissibility of such evidence in the courtroom, with most experts present arguing that this evidence was not appropriately used in this case, and in any event was probabilistic in nature and should never be used on its own in making a legal determination.

Andreas Roepstorff (Associate Professor at the Centre of Functionally Integrative Neuroscience, University of Aarhus, Denmark) & **Kamila Sip** (PhD student at the Department of Anthropology, Archaeology and Linguistics, University of Aarhus, Denmark) gave a joint presentation on the theme “When a lie is not a lie - Neuroimaging of deception in social interaction and lie-detection” which provided the opportunity for an extensive debate about the nature of deception, the multiplicity of questions raised by lying – a lie that the person believes to be true, a white lie, a malicious lie, a lie in different context etc. – and the interpretation of the evidence that could be provided by neuroimaging. While some participants felt that there were valid uses for imaging based lie detection technologies, others believed that these should not be admissible in court, for all the reasons above. It was also noted, as a matter of concern, that while courts have rather good means of evaluating such evidence, the same does not apply to the use of such technologies in areas of the legal process outside the courts, for instance in the course of the investigation. This issue was a repeated concern in the conference.

This was followed by an interesting panel discussion between **Robin Mackenzie** (Department of Law, University of Kent, New Zealand), **Amedeo Santosuosso** (Milan court of appeals and University of Pavia, Italy) and **Nicole Vincent** (Technical University Delft, The Netherlands). Much of this discussion focused on different conceptions of responsibility, culpability and competence in different practices, even within the legal system, the divergences between legal and philosophical notions of responsibility, the specificity of legal reasoning in particular cases, and the need to explore how this actually worked in practice in specific settings.

Tomas Paus (Professor at the University of Nottingham, UK and McGill University, Montreal, Canada) gave a superb presentation on the topic of “Imaging adolescent brain: Causes and consequences.” He argued that 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. He discussed these and other issues in the context of our work on environmental and genetic underpinnings of drug experimentation during adolescence.

Andrew Stanley Balmer (University of Nottingham, United Kingdom) gave an intriguing short talk on the topic of fMRI and the resistance to deception detection in the United States legal system. Balmer made the important point that the real impact of lie detection technology in the US was not in the courtroom, where there are many issues about the admissibility of the evidence, but in the much less clearly regulated pre-trial process, which was full of ‘lie detection talk’ which had significant consequences for the passage of a case to the courts, and the nature of the charge and the plea.

Jennifer Chandler (Associate Professor at the Faculty of Law, University of Ottawa, Canada) gave a presentation on “Reading the judicial mind: How will courts react to the use of neuro-imaging technologies for lie detection?” On the basis of a review of the Canadian cases dealing with the polygraph test, as well as the cases that addressed other novel scientific evidence including DNA evidence, she argued that two reasons to reject neuro-imaging for lie detection will likely be raised. These are, first, that the technology is unreliable, and second, that the evidence is unnecessary because human beings are considered capable of assessing credibility. In addition to being unnecessary, the courts also express concern that the “mystic infallibility of science” will cause the trier of fact merely to defer to the scientific expert, and the concern that the incorporation of technologies will “dehumanize the justice system.”

John P. Lizza (Associate Professor of Philosophy and Chair of the Department of Philosophy at Kutztown University of Pennsylvania, United States) presenting on the topic of “Neuroscience and the definition of death” explored the definition of brain death in the US from the 1981 President’s Commission, which set the standard for brain death as the loss of all brain functions - Individuals with total brain failure have irreversibly lost their internal organic integration, because the brain is necessary to integrate functioning (brain is the control center for the organism’s internal organic integration). An artificially sustained whole-brain dead body is merely a collection of disintegrated organic parts and not an integrated organism as a whole. He traced the criticisms of this view to the recent shift in this definition to a new rationale in 2008, to the effect that individuals with total brain failure are no longer living organisms as a whole, because they have irreversibly lost the capacity to engage in commerce with the surrounding world to secure their sustenance. Because individuals with total brain failure lack the spontaneous “drive” and “felt need” to breathe and interact consciously with the world, they are no longer alive. He outlined some criticisms of this revision of the definition, arguing that we should retain the current whole-brain criterion for determining death, not because total brain failure entails the irreversible loss of organic integration, but because it entails the irreversible loss of consciousness, but refine our understanding of and ability to diagnose permanent vegetative state so that it can be used in the future as a criterion for determining death.

Professor Sir Michael Rutter (Institute of Psychiatry, Kings College London, United Kingdom) presented an impressive overview of the current state of the debate on the neurogenetics of crime and impulsivity. Focusing on gene-environment interactions – how genes get outside the skin and how environment gets under the skin – he outlined recent research in aggression, psychopathy and ADHD. Urging caution on the extrapolation of findings to indicate causal pathways, he concluded that genetic effects are not deterministic, not disorder specific, not even confined to disorder (because findings apply to individuals without psychopathology), and reveal strong gene-environment interdependence. He concluded by identifying real problems of misunderstandings about the role of genetics leading to prohibition of genetic research that could be helpful; arguing that findings on brain development indicate that it is (?) important not to treat children as if they were adults and that findings on GxE and other forms of G-E interplay could have important implications for rehabilitation aspects of judicial decisions. Discussion picked up two issues in particular – the problematic definition and uses of the term ‘psychopathy’ and the dangers of the premature translation of the findings from neurobiological research into a search for the biomarkers for crime and impulsivity.

Avshalom Caspi (Edward M. Arnett Professor, Duke University, United States and Professor at the Institute of Psychiatry, King’s College London, United Kingdom) & **Terri Moffitt** (Knut Schmidt Nielsen Professor at Duke University, United States and Professor at the Institute of Psychiatry, King’s College London, United Kingdom) presented their recent research on “Genetic vulnerability to the social causes of criminal offending”. In the presentation given by Dr. Moffitt, she outlined the findings of their much cited cohort studies in New Zealand concerning vulnerability to environmental stresses and insults (or resilience to such stresses and insults) conferred by genomic variants affecting the activity of elements of the neurotransmitter system (monoamine oxidase A, the promoter region of the serotonin transporter gene, and COMT) and argued for a way of conceptualising these in terms of environmental causes of anti-social behaviour acting on genetic susceptibilities, and thence on the neural substrate, leading to the disorder in question. While genetic risk for anti-social behaviour was well established, she argued, this must be understood in terms of GxE interactions, accounted for only a proportion of the variance, and needed to be further researched by studies in the lab of pathways, and further analysis of the specific environmental factors involved and their causal role. She was optimistic about the potential of Genome Wide Association Studies (GWAS) in illuminating genetic vulnerabilities. In the discussion that followed, Caspi and Moffitt expressed their caution about any premature use of this kind of evidence in legal proceedings, but stressed their potential for preventive strategies.

This was followed by a panel discussion with **Alberto García** (UNESCO Chair in Bioethics and Human Rights, Rome, Italy), **Martyn Pickersgill** (University of Edinburgh, United Kingdom) and **Renata Salecl** (Visiting Professor at the London School of Economics, United Kingdom and Senior Researcher at the Institute of Criminology, Faculty of Law, the University of Ljubljana, Slovenia). Garcia emphasized the

importance of rights-based perspectives, Pickersgill emphasised the gap between promises, expectations and reality, and argued that the key question that would shape the take up of neurotechnologies was their potential utility, and Salecl gave examples of what she termed the “folie à deux” of law and psychiatry.

Hans Markowitsch (Professor at the Department of Psychology, University of Bielefeld, Germany) presented on “Possible consequences of neuroscientific investigations on the legal system” arguing, via multiple cases and examples, for the potential role that neuroscience could play, and was already playing, in legal processes in Germany. This presentation led to a debate about the extent to which this was actual and/or desirable, and to the general agreement that, whatever the laboratory and scientific findings, no single element of evidence from the neurosciences should ever be used out of context or as the sole determinant of a legal judgement, and that if such evidence had a role, it was only as one relatively minor part of a more general picture based on the totality of evidence, including multiple forms of psychological and psychiatric assessment.

Lisa Claydon (Bristol Law School, University of the West of England, United Kingdom) presented on “Criminal responsibility, excuses and the relevance of neuroscientific research”. She presented a number of cases from England in which neuroscientific evidence had been introduced, and explained the careful legal reasoning used by defendants, lawyers and the courts in dealing with this evidence. It became clear that, at least in these English examples, courts were capable of giving rigorous evaluation of the evidence, and that neuroscientific evidence did not dominate other forms of reasoning in legal determinations. Claydon also explained the view of the UK Law Commission on the admissibility of expert evidence, as set out in their recent Consultation Paper 190, and this led to an extensive discussion. ***The conference overwhelmingly gave their support to the recommendations of this report.***

John Lumsden (West London Mental Health NHS Trust, United Kingdom) presented a short paper on “The use of Contingent Negative Variation as evidence”. He argued that evidence suggests that violent impulsive offenders have a number of small and subtle alterations to brain function that may be exhibited functionally in a reduced GO/NOGO CNV and gave the example of an Irish case from 1986 – R. v. Samuel Reid Henry - where such evidence was introduced in relation to a defence of irresistible impulse – the first case in which Brain-wave data were adduced to support a plea of diminished responsibility in a murder case. The evidence was admissible, and it was argued that brain wave data could not be faked, but the argument from ‘will power’ won out and substantial impairment – the ability to exercise will power, including extreme emotional states falling outside medical definitions of illness and abnormality – was not accepted. Thus the common sense notion of the will still has a place in legal reasoning.

Davide Rigoni (University of Padova, Italy) presented a short paper on “Neuroscience and responsibility: neuroscience improves psychiatric assessment” outlining a recent Italian case in which a report had been prepared by a team of neuroscientists claiming, on the basis of genomic and imaging evidence, to contribute to the decision. The defendant was first sentenced to 16 years in the First degree, but the Appeal sentence and the Supreme Court ruling cleared JF from any responsibilities “for a lack of clear and convincing evidence” without referring to the neuroscience report. Nonetheless Rigoni argued that neuroscience can provide data that is useful in psychiatric assessments, although the problem of moving from grouped and averaged data to individual cases raises hurdles. ***The discussion that followed was critical of the relevance of the neurobiological data that the team had collated and presented, and urged great caution and professional responsibility on all those who were tempted to present such evidence in legal settings.***

Peter Kinderman (Professor at the Department of Clinical Psychiatry, University of Liverpool, United Kingdom) presented his argument for “A Psychological model of mental disorder: Implications for law and neuroscience”. He argued strongly that issues of mental health needed to be addressed with a ‘bio-psycho-social model’ of disorder, and that biological, social and circumstantial factors operated through mediating psychological processes to generate psychological and social problems – with the implication that mental disorder should be understood at the level of society and psychology – as well as the brain, and that there is no such thing as ‘abnormal psychology’ or ‘psychopathology’ – there is just psychology. Normal and abnormal, he argued, were on a continuum and this needed to be recognized through a graded legal

approach to questions of responsibility – as found in the Dutch criminal code – rather than a single dichotomy. That the key question to ask was about decision making - "to what extent is the person's decision-making capacity affected by the perturbation, by biological or environmental factors, of her or his psychological processes?". He suggested that moves in this direction could be seen in the Mental Health (Care and Treatment) (Scotland) Act 2003. He concluded that we cannot expect to be free from external influences, so the role of psychiatrists should be to strengthen the ability to make independent choices –to emphasise the centrality of our decision-making. It is less useful to question whether we have free will or, deterministically, lack it...rather we should attempt to develop and nurture our ability to make rational, mindful, choices.

This was followed by two short presentation on psychopathy by **Lukasz Barwinski** (Jagiellonian University, Krakow, Poland) on "Psychopathy and juvenile delinquents – discovering the development of disorder by neuroscience paradigm" and **Rita Mariño-Lourenço** (Universidade Lusófona de Humanidades e Tecnologias, Portugal) on "Psychopathy and neuropsychology: A frontal cortex question?". These two empirical studies using brain imaging led to further discussion about the utility and validity of the category of psychopathy as a basis for legal, forensic and neuroscientific reasoning.

Thomas Scheffer (Free University Berlin, Germany) spoke on demonstrating (free) will in law. He explored the different ways in which free will and responsibility were demonstrated and attributed in ordinary speech and in neuroscience. He argued that Law-in-action demonstrates agency 'mainly by ways of eye-witnessing focussing on "chains of actions" rather than single acts. The longer the chain, the more forceful the attribution of intentionality for the law, and especially where they imply that the actor used extra efforts, overcame resistance in order to follow a project 'of will'. He gave some examples of the way in which this was undertaken in legal discourse, and hence the potential discrepancies with forms of evidence on responsibility provided in neuroscience.

The conference also heard a series of short presentations focussing in different ways on questions of responsibility. **Tom Buller** (Associate Professor at the Department of Philosophy, University of Alaska Anchorage, United States) spoke on responsibility and excusing conditions, exploring the nature and extent of the challenge that neuroscience poses to the law, and its notion that unless otherwise demonstrated, humans should be considered to be intentional, minimally rational actions – abnormal brain function being only pertinent if it can be causally linked to impairments in rationality: thus neuroscience will have a similar impact on the law as behavioural genetics, forensic psychiatry and sociology. **Wayne Hall** (Professor at the School of Population Health, University of Queensland, Australia) gave a presentation on "Reaping the benefits and avoiding potential misuses of addiction neurobiology", setting out the promises of neuroscience research on addiction for treatment and prevention, and explored the reality of the current situation through a number of examples of neuroscience based treatment, arguing that problems often arises from over-estimating the likely efficacy of new technologies, the speed of their implementation, and their impact of science on popular thinking. Finally in this session, **James McGuire** (Professor at the School of Population, Community & Behavioural Sciences, University of Liverpool, United Kingdom) gave a presentation on "Voluntary and determined action in the genesis of criminal acts", exploring evidence from neuroscience and from cognitive psychology, and arguing for these to be understood as they impacted on different phases and stages of a life trajectory, and in interaction with social, familial and environmental factors – concluding by arguing for a version of compatibilism and convergence between concepts of 'determinism' and 'free will', given the interplay of prior determinants, accumulated learning and current concerns in awareness.

Three speakers gave short presentations on the 'biopolitical' aspects of these new relations between neuroscience and law. **Jacopo Martire** (King's College London, United Kingdom) presented on "Neuroscience, modern law and biopolitics: a paradigm shift", arguing that we were moving away from the 'disciplinary societies' within which modern criminal justice systems had taken shape towards what he termed, after Gilles Deleuze, a 'society of control'. **Amade M'charek** (Assistant Professor at the Science and Technology Dynamics Department, University of Amsterdam, The Netherlands) presented a paper written with **Trudy Dehue** (Professor at the University of Amsterdam, The Netherlands) on Regulating the criminal brain, suggesting the notion of "criminality dispositif", - akin to Foucault's sexuality dispositif -, to talk

about the central role of crime in daily life and the biologization/medicalization of criminal behaviour. Using the cases of Attention Deficit and Hyperactivity Disorder (ADHD) and Anti-social Personality Disorder (APD), the paper argued that biologization, population studies and risk assessments are key elements of biopolitics, and that the risk of crime and the biologization/medicalization of criminal behaviour contribute to the criminalization of every day life. Finally in this session, **Martyn Pickersgill** (University of Edinburgh, United Kingdom) presented on “Connecting neuroscience and law: Anticipatory ethics and the making of socio-technical futures”, arguing that the recent relations of neuroscience and law were embedded in a structure of anticipations and expectations, and concluding that in order to conduct an empirically informed and normative debate, we need to be more explicit about our own values and understandings about the natures of science, law and society and be sensitive to and knowledgeable of the theoretical frameworks structuring the responses of others.

Mark Flear (School of Law, Queen’s University, Belfast, United Kingdom) gave a presentation on “Legitimizing EU Regulation of Neuroscience: Is Citizen Participation Required?” He argued that the EU is increasingly involved in the regulation of neuroscience and neurotechnology, an area of scientific uncertainty. Citizen participation is required in order to improve the quality and legitimacy of that regulation. It is first pointed out how the regulation of areas with scientific uncertainty necessitates knowledges beyond science, including those generated by citizens. Hence some of the value of participation for legitimation is to be found in how it can contribute to the pool of knowledges and, therefore, potentially improve the quality and legitimacy of EU regulation. He provided an analysis and critique of the EU discourses constructing citizen participation, which are found in official documents, shows how the EU currently does not take participation seriously and that this undermines the potential of participation to enhance the quality and legitimacy of EU regulation. He concluded by suggesting the EU use discourses that are more conducive to active citizen participation.

Ira van Keulen (Rathenau Institute, The Netherlands) presented on “Neuroscience and law: early signs of policy ambitions and regulatory problems in the Netherlands”. After presenting some of the policy developments in the Netherlands, she outlined some ‘regulatory wastelands’ where problems were emerging that needed to be discussed: some relating to specific technologies, notably neuro-imaging (could people be compelled to undergo imaging, as they are to provide fingerprints, and deep brain stimulation which raised some significant issues of liability). She also outlined some general regulatory problems relating to the role and use of neuroscientific expertise in the courtroom, notably the monopoly position of some experts and the lack of scientific knowledge among judges.

In the final session, **Lieve van Daele** (Federal Science Policy Office, Research Programmes Department, Brussels, Belgium) spoke on “Law and Neurosciences: ‘Pas de Deux’?” She pointed to some gaps between what judges and lawyers wanted of neuroscience and what it was able to deliver and argued that the challenge for scientists was to learn to communicate uncertainty. She concluded by stressing the need for interdisciplinary research in this area and outlining some of the challenges that needed to be overcome in developing such research.

Alberto García (UNESCO Chair in Bioethics and Human Rights, Rome, Italy) gave a “Global Biopolitical Overview of the United Nations: Neurotechnologies and Human Rights in Dialogue” arguing for the universal significance of human rights in this and other areas, if knowledge was to be used for the public good.

In conclusion, **Nikolas Rose** let an open debate on “Where the field is heading, What the field might need, Where ESF should set its priorities, What funding organizations should consider”, the conclusions of which are presented in the next section (Forward Look).

Forward Look

(1 page min.)

- *Assessment of the results*
- *Contribution to the future direction of the field – identification of issues in the 5-10 years & timeframe*
- *Identification of emerging topics*

The forward look sessions highlighted the following key issues for further interdisciplinary research and exploration:

1. Interliteracy

- What is needed to develop inter-literacy between legal experts, neuroscientists and those from the social and human sciences?
- Does it have to be a two (or three/four) way process – who has to learn whose language?
- What would enhance the reflexiveness of the different disciplines about their own rhetorics, in order to promote this?

2. Conceptual issues

- If a pattern of brain activation, or a pattern of SNPs is neither necessary nor sufficient for a 'diagnostic category', what kind of explanation can it provide?
- Are we seeing a fundamental mutation in neurobiological styles of thought (open systems, environment as 'cause' SNPs as mediators, temporality, emergence) and if so what follows?
- Can neurobiology manage without a 'psychology' – whether this be cognitive or psychoanalytic?
- Will neurobiology ever resolve the legal question of responsibility or culpability? Should it try?
- Do we need to move our attention from the question of responsibility to the assessment and management of risk?.
- How are the problem spaces formed within which neuroscience operates?
- How can those from the social and human sciences (and from the neurosciences) account for the current excitement about neurobiology, and what implications would that have for those involved in those practices?
- Is the most fundamental shift, a part of a long term mutation in our conception of what we are as human beings, which will shape the moral intuitions and explanatory logics of authorities and ourselves?

3. Issues of practice and policy

- What responsibility do or should neuroscientists have for the fate of their findings when they leave the lab or the journal article?
- Should the 'neuro' community take a public stand on the admissibility in the courtroom of
 - Evidence from brain imaging
 - Evidence from genomics
- How should the neuro community respond to the perils and promises of early identification (biomarkers, pre-pregnancy advice)?
- Should the neuro community respond (positively) to the UK Law Commission paper on expert evidence?
- "The courts can look after themselves" – but what safeguards or forums to debate what happens before and after the courtroom (preventive policies, pre-trial processes (90% never have their day in court; penal practices, risk assessments; public protection sentences...)
- Beyond precaution – how can we help ensure that neuroscience is used for individual and collective human good?

- Is there a need for a foresight-type initiative?

There is need for more evidence gathering about the situation in different European countries, to be followed by a further event on these issues examining the empirical evidence in more detail.

Atmosphere and Infrastructure

▪ *The reaction of the participants to the location and the organization, including networking, and any other relevant comments*

- The atmosphere was excellent and genuinely collegial and interactive – participants expressed great satisfaction with the level of interaction they achieved in the informal parts of the event, and in the discussion time in the formal sessions.
- The organization was impeccable, thanks to the extraordinary work of **Antje Teegler** from COST, who managed the event with great skill, sensitivity and efficiency, which was commented on by very many participants
- The preparation of the programme was enormously facilitated by the splendid contributions of **Eva Hoogland**, and her management of the event over the whole five days was superb.
- The location, though rather difficult and arduous to reach, was excellent, thanks to the very good weather, although had the weather been inclement, I think that the isolation of the conference venue would have proved problematic.