

CONTEMPORARY ISSUES IN BIOLAW - TOPIC 1

EMERGING NEUROTECHNOLOGIES: LEGAL AND ETHICAL CONSIDERATIONS

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1.1 Introduction

The human brain is usually held as being the key to mind and to behaviour, and so to most of us it is seen as having a special status. Neuroscience, the study of the brain, can give us insights into how mind and behaviour work- and thereby raise significant questions for the law.

Neurotechnologies seek to improve or modify our understanding of cognitive function, including consciousness and thought. In patients, its distinct technologies—including brain-machine interfaces, neural implants, neuroimaging, neurostimulation, and neuroprosthetics—are used to monitor, restore, improve, or alter typical brain function.

Neuroscience and neurotechnology has great potential for improving societal health and well-being. Yet it raises ethical, legal, and social challenges that are perhaps beyond those of other emerging technologies. Neurotechnologies have the potential to challenge fundamental assumptions we make about ourselves, our minds, and the way the law frames them.

Neurorights, a new frontier in human rights, seek to protect individuals from the potential risks posed by emerging neurotechnologies. These rights focus on safeguarding mental privacy, cognitive liberty, and personal identity, which may be vulnerable to manipulation or unauthorized access through brain-computer interfaces, neuro-enhancements, and other neurotechnological tools.

There are already some important practical implications of recent neuroscientific discoveries, which should impact on the law and legal processes, and there will certainly be many more over the next few years. For example, findings from neuroscience may raise questions over the age of criminal accountability. It is also possible that imaging studies may in the not too distant future provide evidence of the nature of pain. This would be relevant to many civil cases, concerned with whether a claimant's suffering and pain are real or exaggerated.

Thinking more deeply, we might ask what neuroscience might offer the law. For instance, might neuroscience fundamentally change concepts of legal responsibility? Or could aspects of a convicted person's brain help to determine whether they are at an increased risk of reoffending? Will it ever be possible to use brain scans to 'read minds', for instance with the aim of determining whether they are telling the truth, or whether their memories are false?

If neuroscience is to feed usefully into the law, there are a number of challenges to its use that must first be overcome. As the technology

advances, these challenges will only increase, but this topic will introduce you to some of the most significant that we can foresee today.

1.2. Lecturer

Dr David Lawrence - Assistant Professor in Biolaw

David is a bioethicist by background researching ethical, legal, and policy implications of emerging biotechnologies, including neurotechnologies, implantable devices, and human enhancement. He has other research interests in bioethics and the medical law more generally, with a current project focussing on the creation of new lifeforms through synthetic biology. He is an expert advisor to the Nuffield Council on Bioethics regarding synthetic human embryos, and on human neural organoids- 'brains in a dish'. He is an editor for the journals *Clinical Neuroethics* and *Cambridge Quarterly of Healthcare Ethics*, and serves on the board of the Human Developmental Biology Resource.



- Room: Palatine Centre PCL171
 - Office Hours: Wednesdays 11am-1pm (Michaelmas)
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2.3 Lecture Outlines

Lectures take place in person at the location on your timetable.

Below is a summary of the lectures and an outline of the reading. The compulsory reading should be completed **before the lectures**. The additional reading is not compulsory (and you do not need to do this in advance of lectures) – but you may find it helpful in preparing for the seminar and/or your assignment.

Please note that not all of the readings are available via library search, but all are available freely to you online either as open access or via institutional login to the publisher's site; and where they aren't, I have provided a link. Feel free to get in contact if you have any access issues to readings.

LECTURE ONE - KEY CONCEPTS IN NEUROSCIENCE AND NEUROLAW

Week 12

The first lecture in this topic will introduce you to some of the basics in neuroscience that will help you understand the technologies of interest, as well as focussing on exploring the purpose of and need for the emerging field of 'neurolaw'. We will examine two major ways in which neuroscience and neurotechnology could affect the law- both as a means of achieving greater understanding of human behaviour to allow for more appropriate regulation, and as a source of novel challenges which existing law may not provide for. We will also touch on some ethical issues raised by emerging neurotechnologies, which underlie the legal challenges we face.

Lecture One Reading (Compulsory)

- None

Additional Reading (Optional)

- [Caruso GD, *Neurolaw* \(Cambridge University Press 2024\) Ch 1, 2](#)
- Stephen J. Morse, 'Neuroethics: Neurolaw' (*Oxford Handbooks Online*, 2017)
<https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199935314.001.0001/oxfordhb-9780199935314-e-45> Section I-III
- [Eryn Brown, 'Is Neurolaw Coming Soon To A Courtroom Near You?' \(*Scientific American*, 2019\)](#)
- [Morse SJ, 'Chapter 16 - Neurolaw: Challenges and Limits' in Hanna Swaab and Gerben Meynen \(eds\), *Handbook of Clinical Neurology*, vol 197 \(Elsevier 2023\)](#)
- Royal Society, 'Brain Waves Module 4: Neuroscience And The Law' (Royal Society 2011)
https://royalsociety.org/~media/royal_society_content/policy/projects/brain-waves/brain-waves-4.pdf

Questions for Reflection

- How does legal doctrine and legal theory make use of ordinary assumptions about the concepts of mind or cognition?
- Are the two forms of neurolaw really all that distinct?
- Is it appropriate to use the known unknowns inherent in neuroscience as the basis for reforms in law, where proof of claim is paramount?
- What challenges might technologies like mind-reading pose to mental privacy and responsibility?

LECTURE TWO - NEURORIGHTS

Week 13

This lecture introduces the concept of neurorights within the framework of emerging neurotechnologies. As brain-computer interfaces, neural implants, and mind-reading technologies become increasingly integrated into healthcare and beyond, the question arises: are existing human rights sufficient to protect mental privacy, cognitive liberty, and personal identity? We will explore the challenges posed by these advancements, focusing on why legal systems may need to adapt. Through case studies and global legislative trends, such as Chile's pioneering neurorights law, this lecture will critically assess the need for a distinct neurorights framework and whether these rights should be enshrined in international law.

Lecture Two Reading (Compulsory)

- Marcello Ienca and Roberto Andorno, 'Towards New Human Rights In The Age Of Neuroscience And Neurotechnology' (2017) 13,5 Life Sciences, Society and Policy. 1-27
- Yuste R and others, 'Four Ethical Priorities for Neurotechnologies and AI' (2017) 551 Nature 159
- [UN Human Rights Advisory Committee, 'Impact, Opportunities and Challenges of Neurotechnology with Regard to the Promotion and Protection of All Human Rights' \(2024\) A/HRC/57/61 SIII\(A\) \(5-10\)](#)
- Bublitz JC, 'Novel Neurorights: From Nonsense to Substance' (2022) 15 Neuroethics 7

Additional Reading

- [Yuste, R., Genser, J., and Herrmann, S. It's Time for Neuro-Rights. \(2021\) 18 Horizons J. Int. Relat. Sustain. Dev. 154-165.](#)
- Lighthart S and others, 'Minding Rights: Mapping Ethical and Legal Foundations of "Neurorights"' (2023) 32 Cambridge Quarterly of Healthcare Ethics 461 9/10
- Cornejo-Plaza MI, Cippitani R and Pasquino V, 'Chilean Supreme Court Ruling on the Protection of Brain Activity: Neurorights, Personal Data Protection, and Neurodata' (2024) 15 Frontiers in Psychology 1330439
- Wajnerman Paz A, 'Is Your Neural Data Part of Your Mind? Exploring the Conceptual Basis of Mental Privacy' (2022) 32 Minds and Machines 395
- [UN Human Rights Advisory Committee, 'Impact, Opportunities and Challenges of Neurotechnology with Regard to the Promotion and Protection of All Human Rights' \(2024\) A/HRC/57/61 SIII-V](#)

Questions for Reflection

- Do current human rights provide enough protection against the risks posed by neurotechnology?
- How might the rise of neurotechnologies challenge traditional ideas of privacy and autonomy?
- Should the law establish distinct rights for the mind, or can existing legal frameworks be adapted?
- What ethical concerns arise when neurotechnologies are used to influence thoughts or behaviour?

Criminal responsibility of children

LECTURE THREE - DEVELOPING BRAINS AND BEHAVIOUR

Week 14

The third lecture will build on your knowledge of neuroevidence to examine whether the Minimum Age of Criminal Responsibility (MACR) of 10 years old in England and Wales is appropriate. While we don't allow 16 year olds to vote, to leave school, or to gamble, we do hold them to be fully responsible for their actions. Neuroscience suggests that our brains are undeveloped and especially our ability to reason and understand consequence are incomplete until late adolescence; and children are led by impulse. We will explore how this sits with the requirements for criminal responsibility and whether or not children are able to meet them.

Lecture Three Reading (Compulsory)

- [Caruso GD, *Neurolaw* \(Cambridge University Press 2024\) Ch 4.1](#)
- [Penelope Brown and Sarah Bunn, 'Age of criminal responsibility' \(2018\) Parliamentary Office of Science and Technology Research Briefing no 557](#)
- Enys Delmage, 'The Minimum age of Criminal Responsibility: A Medico-Legal Perspective' (2013) 13 Youth Justice 102
- Aaron Brown and Anthony Charles, 'The Minimum Age of Criminal Responsibility: The Need for a Holistic Approach' (2021) 21(1) Youth Justice 153, 158.
- Stephen Schleim, 'Real Neurolaw in the Netherlands: The Role of the Developing Brain in the New Adolescent Criminal Law' (2020) Frontiers in Psychology

Additional Reading (Optional)

- Raymond Arthur, 'Rethinking the Criminal Responsibility of Young People in England and Wales' (2012) 20 European Journal of Crime, Criminal Law and Criminal Justice 13
- Children and Young Persons Act 1963
- Megan Moreno and Meaghan E Trainor, 'Adolescence Extended: Implications of New Brain Research on Medicine and Policy' (2013) 102 Acta Paediatrica 226
- Cheryl B Preston and Brandon T Crowther, 'Legal Osmosis: The Role of Brain Science in Protecting Adolescents' (2014) 43 Hofstra Law Review 447

- Nicole A Vincent, 'On the Relevance of Neuroscience to Criminal Responsibility' (2010) 4 Criminal Law and Philosophy 77

Questions for Reflection

- Does having a set MACR make sense?
- How much latitude can the law afford to give?
- Can scientific fact excuse the worst behaviours? Should it take precedence for justice?

LECTURE FOUR - READING MINDS

Week 15

In the final lecture, we will focus on technologies that purport to let us read minds- both prospectively, to discern intentions and plans, and retrospectively, to discover what someone remembers or was thinking. Could such evidence be introduced in the courtroom as a new kind of lie-detector? Could we use thoughts to justify restraint or detention prior to any offence being committed? Focusing primarily on the technologies of **Functional Magnetic Resonance Imaging and Electroencephalography**, we will examine some significant existing cases to highlight a number of serious issues their use may raise both for morality and for the criminal justice system.

Lecture Four Reading (Compulsory)

- [Caruso GD, *NeuroLaw* \(Cambridge University Press 2024\)](#) Ch 2.3
- United States v. Semrau [2010] No. 07-10074, WL 6845092
- Paul Catley and Lisa Claydon, 'The Use Of Neuroscientific Evidence In The Courtroom By Those Accused Of Criminal Offenses In England And Wales' [2015] Journal of Law and the Biosciences. 510-549
- Ed Johnston, 'Brain Scanning And Lie Detectors: The Implications For Fundamental Defence Rights' (2016) 22 European Journal of Current Legal Issues
<https://webjcli.org/index.php/webjcli/article/view/485/649>
- Calvin J. Kraft and James Giordano, 'Integrating Brain Science And Law: Neuroscientific Evidence And Legal Perspectives On Protecting Individual Liberties' (2017) 11 Frontiers in Neuroscience. 621

Additional Reading (Optional)

- Brown CML, 'Neurorights, Mental Privacy, and Mind Reading' (2024) 17 Neuroethics 34
- Frederick Schauer, 'Lie-Detection, Neuroscience, And The Law Of Evidence', in Dennis Patterson and Michael S Pardo (eds) *Philosophical Foundations of Law and Neuroscience* (Oxford University Press 2016) 85-104

<https://oxford.universitypressscholarship.com/view/10.1093/acprof:oso/9780198743095.001.0001/acprof-9780198743095-chapter-6>

- Yu Du, 'The Application Of Neuroscience Evidence On Court Sentencing Decisions: Suggesting A Guideline For Neuro-Evidence' (2020) 18 Seattle Journal for Social Justice. 493-523
- Darby Aono, Gideon Yaffe and Hedy Kober, 'Neuroscientific Evidence In The Courtroom: A Review' (2019) 4 Cogn Research 1-20
<https://doi.org/10.1186/s41235-019-0179-y>
- John Harris and David R. Lawrence, 'Hot Baths And Cold Minds' (2015) 24 CQHE 123-34
- Martha J. Farah and others, 'Functional MRI-Based Lie Detection: Scientific And Societal Challenges' (2014) 15 Nature Rev. Neuroscience. 123-31
- William Woodruff, 'Evidence Of Lies And Rules Of Evidence: The Admissibility Of Fmri-Based Expert Opinion Of Witness Truthfulness' (2014) 16 NCJL & Tech. 105-125

Questions for Reflection

- Is it important that we provide the means to introduce 'mind-reading' evidence into courtrooms?
- What distinguishes (or does not distinguish) this new type of evidence from other 'lie-detection' techniques? Does one 'mind-reading' technique seem more legally acceptable?
- Would the advent of this type of technology suggest a need for new cognitive / privacy rights? Should these be limited in this context?

1.4 Seminar 1

Week 16

To prepare for the seminar, please consider the questions for reflection that are listed for each lecture and come prepared to discuss them. During the seminar, we will engage with a mixture of group activities and discussion on material from across the topic and further reading. There are no wrong answers- the point of the seminar is to discuss what you think of the issues raised in neurolaw, and to learn from each other's perspectives.

In the group exercise, students will be assigned one of several hypothetical scenarios involving the ethical and legal implications of neurotechnology. Each group will break down their scenario, identify key issues, and discuss potential challenges related to neurorights and the law. After, each team will present their scenario to the wider group, explaining the key problems, their thoughts on the issues, and possible approaches they would take to address them.

1.5 For Interest

Part of this course used to contain some discussion of the relationship between neuroscience, free will, and the law. The science (check out the Libet experiments on free will) suggests that we may not have volitional control over our actions in the way we think we might. In fact, actions and decisions appear to be made by our brains and nervous system significantly before we are conscious of making a choice. Clearly, this has significance for law, responsibility, and justice. This is no longer part of the topic, but you may still find this interesting, as I do! The below are just for anyone curious about that- they will not be examined.

- [Caruso GD \(ed\), 'Free Will, Legal Punishment, and Retributivism', *Rejecting Retributivism: Free Will, Punishment, and Criminal Justice* \(Cambridge University Press 2021\) Ch.1](#)
- [Scientific American, 'The Neuroscience Of Free Will: A Q&A With Robyn Repko Waller' \(*Scientific American Blog Network*, 2020\)](#)
- [Adam J. Kolber 'Free Will as a Matter of Law' in Dennis Patterson and Michael S Pardo \(eds\) *Philosophical Foundations of Law and Neuroscience* \(Oxford University Press 2016\) 9-28](#)
- [Stephen J. Morse, 'Neuroscience, Free Will, and Criminal Responsibility' in Walter Glannon \(ed\) *Free Will and the Brain: Neuroscientific, Philosophical, and Legal Perspectives* \(2015\). 251-286.](#)
- Ariane Bigenwald and Valerian Chambon, 'Criminal Responsibility and Neuroscience: No Revolution Yet'. (2019) 10 *Front. Psychol.* 1406.
- Farah Focquaert, Andrea Glenn, and Adrian Raine, 'Free Will, Responsibility, and the Punishment of Criminals' in Thomas A. Nadelhoffer (ed) *The Future of Punishment* (Oxford University Press 2013) 9-28 DOI:10.1093/acprof:oso/9780199779208.003.0012
- Greg Simmons, 'Free Will and Law: Toward a Pragmatic Approach' (2017) 30 *Canadian Journal of Law & Jurisprudence* 215-231

- John Harris. 'Moral Enhancement and Freedom' (2011) 25(2) Bioethics 102-111.