
Law and the brain: introduction

Combining law and the brain as a matter for study requires not just the integration of two apparently remote fields of study but also of two profoundly different orientations towards research and study. We believe that, in spite of the difficulties, such a combination, perhaps even emerging in a new specialized discipline in the future, will not only enrich both fields but is the ineluctable consequence of the current assault on the secrets of the brain. The effort to bring the fields together is therefore a worthy task, and this issue is the first systematic effort to test this expectation.

1. NEW POSSIBILITIES FROM SCIENCE

It was not very many years ago that neurobiology, devoted largely to studying the structure and functioning of the brain, would have considered the law quite remote from its field of enquiry; anyone attempting to connect the two would have been the subject of ridicule. It is a measure of the advances made in neurobiology over the past 20 years that the connection between the two no longer seems tenuous and that eminent neurobiologists should address questions and use language that would have seemed more suited to a court of law or to a department of academic jurisprudence. This enlargement of the province of neurobiology is not restricted to law; indeed the latter may even be considered to be a relative newcomer. Aesthetics, morality, emotional states and decision-making processes are all topics that neurobiologists are currently engaged in actively researching. Yet these areas of interdisciplinary study can still be, to a large degree, pursued with a comfortable level of academic detachment. Law is potentially different—it has immediate practical applications with social and political consequences.

The factors that have brought this radical change in research strategy can be pinpointed with some precision. They can be traced to two advances, one technical and the other conceptual. The technical advance is the development of methods for studying human brain activity. The primary impetus for developing such techniques may have been medical (for example to determine the size and extent of injuries to the brain or the spread of cancers), but they have been modified substantially to make a very considerable impact in studying brain *activity* as well as *anatomy*. There is every sign that the technology associated with such studies will develop and that present-day techniques will soon be outmoded, being replaced by ones that are capable of giving us even more intimate details of the workings of the brain. This technology has recently seen prodigious use by cognitive neuroscience, which relates brain activity to human thought and behaviour, creating a working model of the brain and mind.

The conceptual advance is even more dramatic. It rests on the realization that subjective mental states—the feeling of love, the appreciation of beauty, the desire to cheat, the effort to read the mind of others and much else besides—have particular neural correlates that can be studied with such precision as modern-day technology affords, and which future technology will improve upon. Previously, the study of subjective mental states would have been considered by many to be an unscientific pastime, because it was not objectively verifiable. However, modern-day technology has modified all that, by showing that subjective mental states usually correlate with specific kinds of neural activity across different brains. This has introduced a new framework of enquiry that is bound to have profound effects in many areas of human endeavour, including the law.

2. NEW OPPORTUNITIES FOR LAW

Nor is the scepticism about combining law and the brain limited to neuroscience. Although few would dispute that making, considering and enforcing law are all mental activities, the application of a biological understanding about thought and behaviour to problems in the law has, until recently, been slow to gain acceptance (see O'Hara 2004; Kuklin 2004). Even today, legal scholarship often focuses on the somewhat technical issues of drafting, interpretation and application, as much a field of literary study as a science of behaviour. Over the past century, significant steps have been made in looking beyond these internal concerns, and the academic study of law has expanded to include approaches informed by a variety of other disciplines, in particular the social sciences.

The law has long scavenged other fields for its theoretical underpinnings, and during the twentieth century the most popular targets for incorporation shifted from theology and philosophy to economics and sociology. In this, law was no better or worse than public discourse more generally. Incorporating biology into legal doctrine is of course more problematic. To the extent that biological approaches had been included in the great arguments of the twentieth century between fascism, communism, capitalism, socialism, dictatorship and liberal democracy, they often wore a distorted and appropriately discredited aspect that had more to do with political expediency than with any accurate application of the admittedly limited science of the times. But that biology should have been thus misused in the past is not a good reason for not taking account of its findings in the future, always of course with appropriate safeguards.

There has been a persistent, if perhaps secondary, tradition for applying the insights of psychology to problems of law, a tradition that has illuminated a number of questions (see, generally, *Psychology, Public Policy and Law*). The new neuroscience has the potential to put a

biologically informed psychology front and centre in jurisprudential study. In part, this is a second-hand insight, scavenged once again from the impact that neurobiology is having on such traditional sources of legal borrowing as economics and even philosophy. The impact that behavioural economics, experimental economics and, now, neuroeconomics are having on the mother discipline is beginning to percolate into the study of law (e.g. Goodenough & Prehn 2004; Hoffman 2004; Zak 2004). However, the step from the law to cognitive neuroscience is likely to become more and more a direct one.

3. PUTTING LAW AND THE BRAIN TOGETHER

This issue constitutes the first serious attempt by a major scientific journal to address questions of law as reflecting brain activity and, conversely, to emphasize that it is the organization and functioning of the brain that determines how we enact and obey laws. This neurological link is not unique to law; indeed, it may be said that all human activity is a product of the organization and functioning of the brain, and reflects that activity, fortified by the demands of evolution of which the brain is the most exquisite product. Some aspects of the brain are widely shared across the human species; others are subject to individual variation. The 'bread and butter' of evolution is rooted in variability, which endows individuals with different aptitudes and potentials, on which selective processes can act in the golden and amoral pursuit of shaping the content of the next generation and thus ensuring the survival of the species. Yet variability, while being one of the engines of evolution, is also the source of a problem for the legal system, for in the interests of the common good it cannot allow unchecked expression of that variability. The legal system, not unlike the religious system with which it has been traditionally connected and from which it has often derived inspiration, may therefore be considered at one level to be a struggle against biology, but a struggle that is also ultimately rooted in biology and dictated by the evolutionary biological imperative of maximizing the replicative success of its human participants.

This much belongs perhaps to the relatively safe domain of academic jurisprudence. But there are real issues that the legal system will face as neurobiological studies continue relentlessly to probe the human mind, the motives for our actions, our decision-making processes, aesthetic judgements, and such issues as free will and responsibility. This pursuit will not be a one-way process. The legal profession is at least two millennia older than the neurobiological profession, which is not much more than 150 years old at best, and in its current state of probing the mind of man and his subjective states is far younger than that. The design of paradigms to study brain activity in relation to such topics as the sense of justice, the weighing of probabilities, concepts of ownership and other factors that are important in law, will be not only aided by legal theory and practice, but, indeed, derived from them to a large extent. Yet, as the articles in this issue show, neurobiology has already raised issues that are fundamental to the legal system, and not just in an academic sense but in a practical sense too.

Of the practical ones, the simplest example is the use of modern technology as an improvement and eventual

replacement of older, unreliable and controversial techniques. It is quite possible that, in the very near future, brain-imaging techniques will replace finger-printing and lie detector tests as reliable indices of identity and of the truthfulness of a witness's statement (see Spence *et al.* 2004). This in itself will have repercussions that will probably provoke changes in the law. For example, whereas fingerprinting merely reveals the pattern on fingers and has been used—controversially in some cases—as a means of identification, a functional brain scan will be capable of revealing much more. In this, scanning is not unlike DNA analysis, which can be used in establishing identity and, by extension, parenthood, but which also carries much more information about the individual and has raised troubling issues of privacy and fairness in the law.

Perhaps more problematic for the legal system will be a determination, through the use of modern brain technology, of the extent to which individuals are responsible for their actions. There are naturally states—for example, acute damage, malfunctioning or underdevelopment of the frontal lobe—in which individuals may have lost all sense of morality or propriety as society defines it, with the consequence that they may be held with biological justice not to be responsible for their actions or their consequences (Sapolsky 2004). The more we probe into the brain, and especially the emotional brain and the reasoning brain, the more we are likely to be confronted with mitigating neurological reasons with reason for weighing carefully the type and degree of punishment (Greene & Cohen 2004). The law has, as a general approach and without a detailed knowledge of the brain and its mechanisms, recognized limitations on responsibility in doctrines such as the famous *crimes passionelles* of the French and other legal systems. The linked problems of free will, the degree to which the legal system may assume that the actions of any individual, whether criminal or not, are determined by a free will and, interestingly, the extent to which those dispensing punishment may so interpret the mind and brain of the offender, together take a prominent place in this themed issue. These problems are, of course, unlikely to be resolved easily, but there seems little doubt that the accretion of neurobiological evidence will have a determining influence in the very near future on decisions of the criminal law.

While current and future brain studies are thus likely to be of particular interest in criminal law, it is also likely that other branches of law will come under the spell of new discoveries. The law of property and possession, contract, trust, inheritance, marriage, evidence and many of the other sub-branches of the legal system will all receive detailed scrutiny as neurobiology begins to probe the determining way in which the human brain organizes its decisions and preferences. Above all, perhaps, the law itself will come under more intense scrutiny when neurobiologists begin to probe the brain's sense of justice. Theoretically, it would be difficult for any legal system to enact laws and dispense judgements that most citizens in society can be demonstrated by objective neurobiological evidence to consider unjust. It is indeed possible that, in a 'millennial' future, perhaps only decades away, a good knowledge of the brain's system of justice and of how the brain reacts to conflicts may provide critical tools in resolving international political and economic conflicts.

In his influential *Lectures on jurisprudence*, John Austin (1873), a disciple of Jeremy Bentham and J. S. Mill, tried to promote the notion that jurisprudence should study law as it is, not as it should be, describing and analysing it without reference to whether it is good or bad. The articles in the present themed issue and in future issues of other learned journals, influenced by the developing discipline of neurobiology as applied to jurisprudence, are perhaps more concerned with law as it should be once the characteristics of the organ that ultimately provides all laws will be known. That is a millennial future that all those interested in both branches can begin to look forward to.

4. THE SPECIAL CHALLENGES OF COMBINING SCIENCE AND POLICY

In addition to the general problems of interdisciplinary study, the combination of law and neurobiology faces the special challenges inherent in combining science with questions of policy and its application in law. In part, this arises from a divergence in basic orientation. As Sapolsky (2004) notes in this issue, good science often moves forward by holding questions open, by entertaining a number of possible hypotheses, by recognizing the contingent nature of scientific truth. The law, by contrast, has to close questions out, providing yes or no answers in a short period of time based on limited information. The cultivated uncertainty that is a scientific virtue is anathema to legal decision-making. Scientists frustrate lawyers, and lawyers make scientists nervous. Good work at the law/brain interface requires a cross-cultural understanding as well as an interdisciplinary one.

Another obstacle arises from the problem that scientists have in understanding the utility of counterfactual myths as foundations for effective legal regimes. For instance, in a literal sense, human equality is a myth. Variation ensures that each of us has our own package of strengths and weaknesses. Neither of us, Zeki or Goodenough, has the ability to paint respectably, write good detective fiction, compose songs or play sweeper for even a middling kind of football team. Yet, as a legal matter, the democratic societies in which we live treat us as the equal of those who can do these things. This equality myth is a key element in the maintenance of a particularly admirable kind of social order, a counterfactual that pays dividends in fairness and stability. Proving the law wrong in its declared assumptions may not actually affect the utility of those assumptions (e.g. Goodenough 2004).

An involvement in questions of social application can expose scientists and their research programmes to the vicissitudes of politics. Even in a settled democracy, politics is a rough-and-tumble arena, a wrestling ring where conflicting interests and beliefs square off with lots of broken limbs and bruises. Grants, appointments and laboratory access are tricky enough to obtain on the basis of scientific merit, without also putting them at risk in that wrestling ring. However, it is a risk that we think more scientists should be willing to take. The problems facing us as individuals, members of societies and inhabitants of an increasingly endangered ecosystem all have scientific components. We need the knowledge and insights that scientists can provide,

whether about global warming, genetically engineered foods, the spread of disease or the decision-making processes of adolescents (Baird & Fugelsang 2004). Our politics can be only as good as all branches of society help to make them.

Finally, there are particular inhibitions and taboos about the biology of moral judgement that grow from the deployment, in past years, of cartoons of this kind of science as window-dressing for ideas, some of them quite hideous, that had their source in other passions. Currently, these inhibitions about using biological knowledge to inform policy in the moral realm are most frequently linked with left-leaning political concerns. Certainly biological explanations of morality have had a chequered past in the hands of Spencer and his successors, but biology has been called upon to support the excesses of the left as well as of the right (e.g. Goodenough 1997; Singer 2000; Greene 2003; Kuklin 2004). Ironically, on questions such as stem cell research, it is the right that is resisting the uses of biology. In a model of moral judgement discussed by many of the authors in this themed issue, Haidt (2001) suggests that the rational explanation of a moral choice follows an intuitive judgement. A similar process probably also applies to these cartoon uses of science in politics. Generally, the excesses of both the right and the left have had limited causal connection with the pieces of scientific camouflage that have been commandeered to give them respectability. Rather than being linked to repressive approaches, Greene (2003) argues that a scientific understanding of the nature of moral judgement should help promote tolerance and peace.

We believe that the antidotes to the ignorant use of bad science in law and policy are better science, not less science, and a better understanding of what the science means, rather than greater ignorance. We hope that the work presented in this themed issue will promote these goals. They do not shy away from making their political starting and ending points known, and there is enough of a spread from left to right in the positions taken in this issue to suggest that the insights coming from neurobiology, honestly interpreted, will confirm, confound, challenge and surprise all parts of the political spectrum. The insights may even throw light on the difficult choices between conflicting social goods that underlie many of our most intractable legal and political dilemmas.

5. THIS ISSUE

The essays in this issue cover a range of topics at the intersection of law and neurobiology. Their organization here is not random. Taken in order, they are intended to provide a loose progression for the reader. The Preface by Lord Bingham, Britain's senior law lord, together with this Introduction by us are intended to set the stage. The first two essays, 'The neuroeconomic path of the law' by Judge Morris Hoffman (Colorado) and 'How neuroscience might advance the law' by Erin O'Hara (Law, Vanderbilt), put the combination of law and the brain into its context in jurisprudence and the legal academy, both intellectually and politically. The next two essays, 'Law and the sources of morality' by Robert Hinde (Zoology, Cambridge) and 'Law, evolution and the brain' by Owen Jones (Law and Biology, Vanderbilt), examine the underlying principles of

evolutionary biology that provide a foundation for the proximate brain mechanisms involved in morality and law. In the final introductory article, Oliver Goodenough and Kristin Prehn (Psychology, Humboldt) describe 'A neuroscientific approach to normative judgement in law and justice', reviewing the state of research into normative judgement, making the link between law and cognitive neuroscience, and providing, along the way, an introduction to the methods of cognitive neuroscience for the lay reader.

The next pair of articles, 'The brain and the law' by Terrence Chorvath (Law, George Mason) and Kevin McCabe (Economics and Law, George Mason) and 'Neuroeconomics' by Paul Zak (Economics, Claremont Graduate University) provide complementary reviews of exciting developments in economics growing out of the new neuroscience. Both also suggest potential applications of these developments to legal concerns, particularly in the realms of economic exchange and institution building. Although non-lawyers often think first of criminal law when they consider the legal system, creating structures for reliable economic activity is one of law's most important functions. Zak's essay also includes an introduction to brain anatomy for non-specialists.

Moving to more specific legal problems, the issue next presents a pair of articles on courtroom concerns: 'A cognitive neuroscience framework for understanding causal reasoning and the law' by Jonathan Fugelsang (Psychological and Brain Sciences, Dartmouth) and Kevin Dunbar (Psychological and Brain Sciences and Education, Dartmouth), and 'Scanning the deceiving brain' by Sean A. Spence, and his colleagues (Psychiatry, Sheffield). A better understanding of how people evaluate evidence as they come to decisions and of the neurological processes of deception should be of particular interest to judges and courtroom advocates. The next article, Jeffrey Stake's treatment of 'The property' 'instinct', posits a neurobiological logic for this important human—and perhaps animal—institution.

The themed issue closes with a group of four articles that revolve around the conundrum of criminal responsibility. In 'For the law, neuroscience changes nothing and everything' Joshua Greene (Psychology, Princeton) and Jonathan Cohen (Psychology, Princeton), advance a forceful attack on the idea of free will generally and on the patterns of criminal punishment that flow from a starting point of volition and blame. Robert Sapolsky (Biology and Neurology, Stanford) offers a further critique of the law of criminal responsibility, making the explicit connection between 'The frontal cortex and the criminal justice system'. In 'The emergence of consequential thought: evidence from neuroscience', Abigail Baird (Psychological and Brain Sciences, Dartmouth) and Jonathan Fugelsang review the emerging understanding of the physiology of brain maturation in adolescents and draw conclusions about the ability of this group to reason effectively about the consequences of their actions. Finally, Oliver Goodenough poses the countervailing question: 'Responsibility and punishment: whose mind?' He suggests that the psychology of punishment may have more to do with the legal tests of competency than the psychology of the offender.

We believe that this issue can be read not only for its specific articles but also as an interrelated whole. As editors, we have been challenged, educated and provoked to further thought by the contributions to this themed issue. Whether you are a specialist in law, psychology or neurobiology, or are simply a reader with a lively interest in recent developments in subjects of critical importance for humanity, we hope that you, too, will find the articles that follow exceptionally stimulating reading.

Semir Zeki¹

Oliver R. Goodenough²

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¹Laboratory of Neurobiology, Department of Anatomy and Wellcome Department of Imaging Neuroscience, University College London, Gower Street, London WC1E 6BT, UK

²Vermont Law School, PO Box 96, Chelsea Street, South Royalton, VT 05068, USA

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