

# A neuroscientific approach to normative judgment in law and justice

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Developments in cognitive neuroscience are providing new insights into the nature of normative judgment. Traditional views in such disciplines as philosophy, religion, law, psychology and economics have differed over the role and usefulness of intuition and emotion in judging blameworthiness. Cognitive psychology and neurobiology provide new tools and methods for studying questions of normative judgment. Recently, a consensus view has emerged, which recognizes important roles for emotion and intuition and which suggests that normative judgment is a distributed process in the brain. Testing this approach through lesion and scanning studies has linked a set of brain regions to such judgment, including the ventromedial prefrontal cortex, orbitofrontal cortex, posterior cingulate cortex and posterior superior temporal sulcus. Better models of emotion and intuition will help provide further clarification of the processes involved. The study of law and justice is less well developed. We advance a model of law in the brain which suggests that law can recruit a wider variety of sources of information and paths of processing than do the intuitive moral responses that have been studied so far. We propose specific hypotheses and lines of further research that could help test this approach.

**Keywords:** normative judgment; moral judgment; law; emotion; intuition

## 1. INTRODUCTION

How do humans think about right and wrong? This critical question has recurred in law, philosophy, the arts and religion over the centuries. As David Hume (1739, p. 31) wrote, 'morality is a subject that interests us above all others'. More recently, this question has engaged psychology and other scientific approaches to human thought and behaviour: including the emerging science of human brain function. Interest has not abated in the twenty-first century. A recent review of neuroscientific approaches to normative judgment declared, 'the neurobiology of moral cognition is a justifiably hot topic' (Casebeer & Churchland 2003, p. 170).

Although the topic is hot, the scope of this essay is necessarily limited; it cannot hope to be a fully comprehensive treatment. Partly this is a matter of length: this is an essay, not a treatise, and so it must make simplicity of argument and selectivity of evidence a virtue. Partly it is a matter of interdisciplinary fatigue. The study of law and the brain rests on several fields: law, philosophy, economics, psychology evolutionary biology, neurology and cognitive neuroscience being, at best, a partial list. As we write this essay our expertise is stretched thin in some places, and a limited scope is perhaps a blessing. For those seeking greater detail, we have sought to provide a sufficiently broad selection of primary and secondary references to allow further pursuit.

Nonetheless, we attempt to tell a complete story, one that provides not just a description of current thinking, but also sufficient historical, theoretical and methodological background to put the contemporary story in context (for additional background, see Haidt 2001; Casebeer & Churchland 2003; Greene 2003; Pigliucci 2003). We also want to foreshadow the future, exploring two of the many lines of possible research that spin out of an approach to the problems of law and justice informed by neuroscience. Finally, our goal is to tell a story that readers on both sides of the law and science divide will be able to follow. This has led to some push and pull between the authors over matters of style and assertiveness, with the scientist seeking to rein in the expansiveness of the lawyer and the lawyer seeking to set aside the caution of the scientist. A reader with a background in the disciplines related to cognitive neuroscience may wish to skip over the introductory material in § 3.

This essay is divided into five topics: (i) a review of traditional models of normative thinking, including philosophy, religion, law, psychology and economics; (ii) an introduction to the possibilities, methods, and limits of the new cognitive neuroscience; (iii) a review of recent developments in the neurobiology of normative thinking; (iv) a model of the role of law and justice in normative judgment; and (v) a sample of the kinds of investigations into concrete problems in the law and justice that a neuroscientific approach makes possible.

As a final introductory matter, what do *we* mean by morals, justice and normative judgment? Definitional questions have been part of the debate as well. Some make distinctions between morals and ethics. Others distinguish conventional from moral, and both from legal. In the

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One Contribution of 16 to a Theme Issue 'Law and the brain'.

neuro-scientific literature, Casebeer (2003 p. 842) uses the term 'moral cognition', which he admits 'might not be a tightly defined 'natural kind' in the sense that other cognitive phenomena might be'. The arguments over these taxonomies can fill volumes (e.g. Casebeer & Churchland (2003); Haidt (2003) and the extensive surveys of moral and ethical traditions in LaFollette (2000) and Singer (1991)). In the context of this essay, this long and distinguished history of argument, speculation and empirical study can only be briefly excerpted, and only a few of the most important strands identified.

For our own usage, we like the term 'normative judgment' as an inclusive description of the many flavours humans find among those things that ought to be done and those that ought not to be done, particularly in the social context of interaction with other humans. In this sense, normative judgment first involves the construction of a system (or systems) of norms, values and expectations, and, second, the evaluation of the actions of another agent, or of our own actions, made with respect to these norms, values and expectations. Our position in this essay is that the mental processes of performing this function are not unitary, but on the contrary involve some number of different approaches. We have a suspicion that these differences are at the heart of many of the historical arguments over terminology.

For this essay, we do sometimes distinguish 'moral reasoning', a relatively affect free, consciously accessible process, from other, more intuitive and emotionally based processes of normative judgment. We also sometimes follow the convention that the term 'cognitive' suggests processes on the reasoning-rational-conscious end of the spectrum as opposed to emotion-linked 'affective' processes. Others have extended 'cognitive' to encompass a wider range of mental processes, such as its use in 'cognitive neuroscience'. Please let context be your guide.

## 2. TRADITIONAL MODELS OF NORMATIVE THINKING: INTUITIONISM, MORAL REASONING, LAW AND THE SENSE OF JUSTICE

### (a) *Examples from philosophy and religion*

At a gross level of description, the study of normative thinking has often divided into strands that value either intuition and emotion on the one hand, or reason on the other. One strand, called by some 'intuitionism', holds that the primary source of normative judgment comes from intuitively accessed moral sentiments (Dancy 1990). Hume (1739) provides a classic description of this approach, arguing that moral distinctions are not derived from reason, but rather from a moral sense, whose workings are not accessible to our conscious intelligence, 'morality, therefore, is more properly felt than judged of...' (Hume 1739, p. 43). Furthermore, Hume linked morality with emotional responses, or the 'passions', as he termed them. This link allowed morality to influence action in a way that pure reason never could.

Starting from these principles, Hume posited the argument often called the 'naturalistic fallacy'. Because moral sentiments are separate from facts, no logical proposition with facts alone in its predicate can contain a moral judgment in its conclusion. Only by basing an argument on a moral predicate, can a moral conclusion be obtained;

facts and reason alone cannot provide a valid moral conclusion (Hume 1739; Greene 2003; Pigliucci 2003). A corollary of this was Hume's presumption that moral sentiments could not be readily reduced to facts. This left the systematic study of normative judgment somewhat high and dry: our reasoning, conscious selves cannot peer through the impenetrable fence beyond which intuition, emotion and sentiment hold sway.

In contrast to intuitionism stand moral systems which base themselves in reason. The work of Immanuel Kant is a classic example of this approach (Pigliucci 2003). Through the application of reason, Kant seeks to arrive at universal rules to govern human action: the famous 'categorical imperative' (Kant 1953; also see O'Neill 1991). A recent example in the rationalist tradition of Kantian ethics is 'A theory of justice' by John Rawls (1971). One perceived benefit of a Kantian approach is that questions of morality are open to rational, if still often introspective, study in a way that intuitionism largely defies.

Religiously grounded systems of morality add another strand to the discussion. Most religions point to divine origins or sanctions for a moral code, an approach some philosophers term the 'divine command theory' (Quinn 2000). In the Judeo-Christian Bible, God presents the 10 commandments to Moses. Muhammad receives divine guidance on moral questions which he relates to the wider world in the Koran. In the New Testament, the words of Jesus and the letters of his early followers contain many directives on the values that should form the basis of a moral life. The divine origin of values may not be susceptible to deductive proof (Quinn 2000), but it is deeply rooted in the faith of millions.

For our purposes, the next questions are the interesting ones: how do people find out and apply the content of these values? Traditional explanations for these steps sometimes cite to reason, at other times to intuition, and sometimes to both. Aquinas, for instance, argued that we perceive the general principles of 'natural law', as the divine system is sometimes called, through a kind of intuition he called 'synderesis'. We then use reason to derive secondary principles of more specific application to the needs of time and place (Gill 1995).<sup>1</sup>

Although the reason-intuition divide has been a particular concern of Western ethical and religious thought (Hansen 1991), the recurrence of similar distinctions in the moral traditions of non-European societies (e.g. Hourani 1985; Hansen 1991; Hallaq 1997) suggests that the distinction is not simply a localized cultural artefact.

### (b) *Intuition versus reason in the law*

When it has bothered with introspection and internal justification, the law has both reflected these larger debates and added its own concerns. Anglo-American jurisprudence has often focused on a rules or feelings dichotomy, distinguishing between the reason-based dictates of law and an intuition-based sense of justice. This distinction has been a perennial subject for the debates and theories of the law (e.g. Austin 1832; Holmes 1881; Kelsen 1934; Hart 1961; Weinreb 1987; Gruter 1992; also see Goodenough 1997b). How one analyses problems through the application of word-based legal rules (often called 'positive law') and how one reacts to them as a matter of intuitive 'justice' (often called 'natural law') can sometimes give

very different results (Goodenough 2001a). This has been demonstrated in the treatment of such issues as mandatory criminal sentencing (Smith & Cabranes 1998), the role of juries (Posner 1999; Feigenson 2000) and conflicting approaches to statutory and constitutional interpretation (Tribe 1985; Scalia 1997).

As with philosophers, legal theorists and jurists have been aware of the difficulty of penetrating into the intuitive realm of justice. Some decided that this put the topic of justice effectively beyond study:

Justice qua absolute value is irrational. However indispensable it may be for human will and action, it is not accessible to cognition. Only positive law is given to cognition, or, more accurately, is given to cognition as a task.

(Kelsen 1934, pp. 17–18)

Others, by contrast, have viewed intuitive standards as a source of legal authority. The Georgia Supreme Court used such reasoning in establishing a right of privacy in 1905:

The right of privacy has its foundation in the instincts of nature. It is recognized intuitively, consciousness being the witness that can be called to establish its existence. Any person whose intellect is in a normal condition recognizes at once that as to each individual member of society there are matters private, and there are matters public so far as the individual is concerned. Each individual as instinctively resents any encroachment by the public upon his rights which are of a private nature as he does the withdrawal of those of his rights which are of a public nature. A right of privacy in matters purely private is therefore derived from natural law.

(Pavesich versus New England Life Insurance Co. 1905, 50 S.E. 68, pp.69–70)

The intuition–reason argument was to some extent set aside in American jurisprudence with the emergence of the ‘Realist School’ in the middle of the twentieth century. Realism switched the focus from the source and nature of moral thinking in law to its effects as realized public policy (e.g. Llewellyn 1931), a move realism shared in psychology with behaviourism and in philosophy with utilitarianism and other forms of consequentialist ethical thought. In order to look effectively to consequences, realism requires:

... the *temporary* divorce of Is and Ought for purposes of study. By this I mean that whereas value judgments must always be appealed to in order to set objectives for inquiry, yet during the inquiry itself into what Is, the observation, the description, and the establishment of relations between the things described are to remain *as largely as possible* uncontaminated by the desires of the observer or by what he wishes might be or thinks ought (ethically) to be.

(Llewellyn 1931, p. 1236)

Jurisprudential trends as ideologically varied as law and economics and critical legal studies have used the basic assumptions of realism as a starting point (Goodenough 2001a).

#### (c) *Scientific accounts of normative judgment I: moral reasoning*

The past two centuries have witnessed the development of scientifically grounded understandings of human mental processes. Psychology and related disciplines have provided descriptions of increasing explanatory and predictive power (Goodwin 1999). The study of the human capacity for normative judgment has been an ongoing target in this

history of enquiry. One of the most influential lines of research and theorizing has centred on a developmental model of cognitive abilities associated with Jean Piaget and Lawrence Kohlberg (e.g. Piaget 1965; Kohlberg 1969, 1981; Kohlberg & Candee 1984; Crain 2000; Haidt 2003). Building on Piaget’s work, Kohlberg generated a widely cited six-stage model of the development of moral reasoning, through which, he argued, humans progress as their cognitive abilities mature and come to a more sophisticated understanding of social relations.

In his empirical studies, Kohlberg presented children and adolescents with dilemmas that contained conflicts about issues of life, interpersonal obligations, trust, law, authority and retribution. In his best known dilemma, a man named Heinz must decide whether he should break into a druggist’s shop to steal a medicine that would save the life of his dying wife (Crain 2000). As Kohlberg analysed how people resolved such conflicts, he discerned a six-level progression of increasing sophistication, a progression that he linked to the development of his subject’s cognitive abilities (for example, the ability for perspective-taking). One formulation describes stage 6 as follows.

Stage 6: The universal ethical-principle orientation. Right is defined by the decision of conscience in accord with self-chosen ethical principles that appeal to logical comprehensiveness, universality, and consistency. These principles are abstract and ethical (the Golden Rule, the categorical imperative); they are not concrete moral rules like the Ten Commandments. At heart, these are universal principles of justice, of the reciprocity and equality of the human rights, and of respect for the dignity of human beings as individual persons.

(Kohlberg 1971)

This description is clearly in the Kantian tradition. It not only values and privileges conscious reasoning as the ultimate in moral cognition, but it explicitly cites the categorical imperative as an example. Kohlberg’s work has had a profound influence on the scientific study of morality. With its attention set on moral reasoning, this branch of psychology has viewed emotion and intuition as disturbing factors (e.g. Sutherland 1994; see also Posner 1999), problems to be excluded from the investigation of the reasoning and judgment processes at the heart of moral thinking. As a result, much of the research on moral judgment in the latter part of the twentieth century was rooted in cognitive models, in which proper normative judgment was thought to be the result of moral reasoning.

#### (d) *Scientific accounts of normative judgment II: a role for intuition and emotion*

Of course, academia is seldom a monoculture, and there have been persistent lines of explanation in moral psychology and related disciplines that focus on emotion and intuition (LeDoux 1996; Pigliucci 2003). Emotion generally has always been a matter in study and theorizing in psychology (e.g. Darwin 1872; Plutchik 1980; Frijda 1986; Ortony *et al.* 1988; van der Meer 1989; Kemper 1990; Hatfield *et al.* 1993) and the pace has only accelerated in the past decade (e.g. LeDoux 1996; Panksepp 1998; Damasio 1999; Rolls 1999; Plutchik 2001; Davidson *et al.* 2002; Döring 2003; Haidt 2003; Solomon 2004). The contrast between rule-based decision making and intuitive, emotional judgment has been studied in a wide variety of psychological contexts (e.g. Cowan 1965; Etzioni 1988;



Mellers *et al.* 1998). De Souza (1987) argued that far from being the enemy of good judgment, emotion is an essential element in rational thought.

In the context of normative judgment, Jerome Kagan (1984) and Martin Hoffman (1981) are among those psychologists who argued for the importance of emotional states in moral thinking, and even some working from the starting points of Kohlberg and Piaget acknowledge the role of affective processes as well (e.g. Damon 1988). In recent years, the interest in psychology on the role of emotion and intuition in normative judgment has flourished (Haidt 2001, 2003; Döring & Mayer 2002; Stephan & Walter 2004).

While many in law have distrusted emotion and intuition (Posner 1999), other important figures in legal psychology have argued for the importance of intuition and emotion in normative judgment (generally, Bandes 1999; Posner 2001). In 1881 Oliver Wendell Holmes Jr. wrote:

The life of the law has not been logic: it has been experience. The felt necessities of the time, the prevalent moral and political theories, intuitions of public policy, avowed or unconscious, even the prejudices which judges share with their fellow-men, have had a good deal more to do than the syllogism in determining the rules by which men should be governed. (Holmes 1881, p. 5)

In 1996, Yale scholar Paul Gewirtz, reacting to an excessive emphasis on rational processes in judging, mused:

All too often judges and scholars who write about law assert an inappropriately sharp distinction between the rational and the nonrational, especially between reason and emotion—invoking an overly narrow concept of reason and contrasting reason and emotion in an overly simplified manner. These discussions usually arise in the context of a traditional normative argument that judging is a realm of reason, not emotion. (Gewirtz 1996, p. 1029)

The study of juries—and their ‘failures’ in applying clear reasoning in their decision making—has given an empirical grounding to concerns with intuition, sympathy, emotion and heuristics in the law (e.g. Feigenson 1997, 2000; Charman *et al.* 2001). Neal Feigenson (2000) reviews a wide spectrum of this research. In coming to the broad conclusion that jurors seek to achieve what he calls ‘total justice’, Feigenson cites many studies indicating the role of intuitive, emotional factors in jury thinking and suggests that the goal of jurors is to integrate these with more explicitly rule-based cognition to create a satisfactory amalgam, ‘which sometimes may be more justice than the law recommends’ (Feigenson 2000, p.104). Others have applied a cognitive bias approach to understanding motivation in employment discrimination (Krieger 1995) and have explored the role of non-cognitive processes in criminal responsibility (Reider 1998).

Evolutionary psychology provided its own particular impetus towards a broader line of inquiry into moral reasoning. This approach looks for evolutionary explanations for human thought and behaviour (e.g. Cosmides & Tooby 1987; Laland & Brown 2002). It argues that our social responses—including our moral sense—evolved at a time when conditions were quite different than they are in contemporary society, and it predicts, at times, a mismatch between our intuitive predilections and what a more rea-

soned approach might provide (Jones 2001a). Evolutionary psychology has also argued for a high degree of continuity between human mental processes and those of other animals, particularly those of our near primate relations (e.g. Darwin 1872; de Waal 1996). Either implicit or explicit in most of these arguments is a picture of normative judgment in humans that is at odds with the Kantian empowerment of reason.

**(e) *Scientific accounts of normative judgment III: not a proper study***

Some in psychology who followed the behaviourist approach would have avoided the debate over the nature of normative judgment altogether, arguing that science can never understand the nature of moral thinking. For the behaviourists, this grew out of a conviction that behaviour, and not the internal mental states of an actor, was the proper sphere of study (e.g. Watson 1924; Skinner 1953). It was not so much the *normative* part that put them off as it was the *judgment*. Since the 1960s (e.g. Neisser 1967), cognitive approaches and investigations of reasoning and judgment processes in experimental paradigms have largely eclipsed behaviourism in psychology.

Others, including several scholars of morality and the mind, have taken what might be called a romantic view of normative processes, questioning the susceptibility of moral cognition to systematic psychological study. Arguments from this position take many forms. Some, like Stephen Morse (2004) in his sceptical but balanced discussion, admit the theoretical possibility of describing normative judgment in material terms, but declare that the complexity of the task renders it effectively undoable. Others, including most philosophers of mind, declare the task fundamentally impossible (Morse 2004).

The more respectable version of the impossibility argument rests on the concerns about the jump from ‘is’ to ‘ought’ that are at the heart of the naturalistic fallacy, which Greene (2003) calls ‘the mistake of identifying moral properties with natural properties’. But this assertion begs a question: if ought is something more than the conclusion of a particular kind of natural mental process, where does that something more come from? Even the Kantian move to duty, rationalism and universals merely shifts the exercise from one mental process to another. In all of its forms, this train of argument attributes to moral standards an independence from physical causation in the discoverable processes of the brain. And the question remains: if not physical processes, then what? At heart, the romantic approach rests on an often unacknowledged spiritualism: some non-physical standard exists ‘out there’ that we connect with by some kind of revelation or transcendent communication. Aquinas explored this, and it is a perfectly respectable intellectual proposition. It should, however, be acknowledged for what it is.

**(f) *Economics: a similar story***

During the latter part of the twentieth century, moral psychology was not alone in its focus on reason as the proper mode of thought. The hugely influential discipline of neoclassical economics rested many of its explanations on rational actor models of human psychology (Kahneman 2002). Irrational, intuitive and emotion-driven thought and action were seen by some in this context as aberrations,

and not part of what people *should* or, in fact, *did* do (Posner 1999, 2001; Korobkin & Ulen 2002; McKenzie 2003).

In recent years, the rationality assumption has been effectively challenged. Robert Frank was among those raising the opposition, notably in his 'Passions within reason: the strategic role of the emotions' (Frank 1988). Overly simplistic views of rationality have been questioned in a variety of new economic sub-disciplines, including behavioural economics (e.g. Kahneman 1974, 2002; Tversky & Kahneman 1974, 1981; Kahneman & Tversky 1979; Korobkin & Ulen 2002), experimental economics (e.g. Smith 1982, 1991; McCabe & Smith 2000), and neuroeconomics (e.g. McCabe *et al.* 1996, 1998, 2001; Glimcher 2003; Hoffman 2004; Zak 2004). The awarding of the Nobel Prize in economics in 2002 to Daniel Kahneman and Vernon L. Smith for their work in these fields marked the recognition by the discipline that a broader cognitive model, more firmly rooted in empirical study, was necessary for economics to progress.

### 3. ADVANCES OF COGNITIVE NEUROSCIENCE

New knowledge is allowing us to reconsider our theories of normative judgment and to apply powerful new tools to its study. Advances in our understanding of the brain, its functions, and the ways in which those functions shape the nature of human thought, together with emerging tools of neuroscientific investigation, allow us to lift the veil that has hidden the workings of the brain and mind, whether intuitive or rational, from objective study. We believe that we are in the early stages of what will be a highly productive period in the study of normative thinking.

Many of the recent advances in this process have been made possible by a collection of technological and theoretical developments often referred to as cognitive neuroscience. This somewhat flexible label (coined, the story goes, during a New York taxi ride in the late 1970s (Gazzaniga *et al.* 2002)) covers an approach that seeks to integrate into the study of human thought, our rapidly emerging knowledge about the structure and functions of the brain, and about the formal properties of agents and decision-making processes (e.g. Marr 1975; Gazzaniga *et al.* 2002; Frackowiak *et al.* 2004; see also the *Journal of Cognitive Neuroscience and Trends in Cognitive Sciences*, *passim*). Although cognitive neuroscience was well launched before the advent of such imaging technologies as PET and fMRI, the availability of non-intrusive methods that allow us to establish functional connections between mental tasks and specific anatomical structures has increased its power and accelerated its application (Savoy 2001; Frackowiak *et al.* 2004).

The great advantage of the cognitive neuroscience approach is that we now can bring together psychological models of cognitive and affective processes, experimental paradigms, various behavioural and psychophysiological measurements and functional brain imaging techniques. Therefore we are no longer dependent on observations of the behaviour or introspection and self-report alone as the basis for examining thought. Rather, we can formulate and test hypotheses about the whole chain from the 'input' of the senses through the 'processing' in the brain and on to the 'output' of action and behaviour. Some traditional

psychology, at the behaviourist extreme, was left with a mysterious 'black box' as the explanation for the central part of this chain, a limitation the behaviourists sought to convert into a virtue. By untangling human brain function itself and relating it to the processes of sensation, thought and action under study, we can offer much more complete and competent descriptions and explanations of human psychology (e.g. McCrone 1999; Humphreys & Price 2001; Miller 2003; Frackowiak *et al.* 2004). By way of simple-minded analogy, one could develop a useful science of automobiles without ever opening up the hood or bonnet of a car, but it would rely on explanations such as 'the car's desire to move inspires its motive force'. With the engine exposed, a much more complete explanation is possible.

By combining the best of traditional psychology and its related disciplines with the new approaches of cognitive neuroscience, mental activities as diverse as visual perception, memory, language use, emotion, deduction and consciousness have begun to yield some of their secrets (Frackowiak *et al.* 2004). In recent years the thought processes related to social cognition in general (Blakemore *et al.* 2004) and normative judgment in particular (Haidt 2001, 2003; Casebeer 2003; Casebeer & Churchland 2003; Greene 2003; Pigliucci 2003; Moll *et al.* 2003) have also become a target for this kind of study. The boundary that Hume and Kelsen could not cross is becoming permeable. Before turning to a survey of recent developments in the neurobiology of normative judgment, however, it is useful to review aspects of the cognitive neuroscience approach that have particular application to this study.

#### (a) *Richer cognitive models*

The new neuroscience rejects the unitary models of human thought that have informed some branches of philosophy and psychology since the time of Descartes (Damasio 1994; Restak 1994); rather, it is comfortable with cognitive complexity. The principle of sorting and prioritizing multiple pathways is reflected in the nature of neuronal network processing (e.g. Smith & Ratcliff 2004) and appears to function at much 'higher' levels of activity as well. For instance, in describing the effect of emotion on decision making, Joseph LeDoux has contrasted the image of a quick, unconscious 'low road' through the amygdala with a slow, conscious 'high road' through the sensory cortex in the brain (LeDoux 1996). In a similar vein, Kahneman & Frederick (2002) argue for a 'dual process model' which has room for both intuitive and deliberative processes:

The essence of such a model is that judgments can be produced in two ways (and in various mixtures of the two): a rapid, associative, automatic, and effortless intuitive process (sometimes called System 1), and a slower, rule-governed, deliberate and effortful process (System 2). System 2 'knows' some of the rules that intuitive reasoning is prone to violate, and sometimes intervenes to correct or replace erroneous intuitive judgments. Thus, errors of intuition occur when two conditions are satisfied: System 1 generates the error and System 2 fails to correct.

(Kahneman (2002), references omitted; see also Evans (2003))

This application of complexity and multiplicity is not restricted to overarching models. At the level of more detailed neuroanatomy, experimentation has made progress in establishing the brain regions associated with

such capacities as the different aspects of musical performance, perception and comprehension (Parsons 2003). Even the capacity to bring together and reconcile the different functional systems and processes may be carried on in particular locations. The capacity to resolve conflicts between possible responses may involve particular loci in the anterior cingulate cortex and the dorsolateral prefrontal cortex (Frith *et al.* 2004).

#### (b) *Specialization and integration*

The degree to which different mental activities rest on dedicated pieces of brain architecture has been a subject of some controversy (Savoy 2001; Posner 2003; Aron *et al.* 2004). Clearly there is a significant degree of functional localization and specialization, a principle particularly well demonstrated in the field of vision (Zeki 1990; Bartels & Zeki 2004). Although not as congruent with the subjective experience of our own minds as the old Cartesian unified model, this approach better explains the loss of particular faculties and the retention of others which can result from a stroke or other brain injury (e.g. Moore & Price 1999; Savoy 2001).

Perhaps the most assertive conception of functional separation in recent scholarship was the idea of the 'modular brain', an expression widely adopted in early 1990s (e.g. Gazzaniga 1992; Restack 1994; Frackowiak *et al.* 1997; Gigerenzer 1997), but which has more recently fallen out of use. At its most extreme, some used the metaphor that the mind resembles a Swiss Army knife, with several different, if interconnected, tools that can be brought to bear on the problems that life presents (Cosmides & Tooby 1987, 1992). Asserting this degree of specialization and segregation became controversial (Sperber 2002), and the current view takes a more balanced approach that emphasizes both specialization and integration:

The brain appears to adhere to two fundamental principles of functional organization, functional integration and functional specialization in which the integration within and among specialised areas is mediated by effective connectivity.

(Friston 2004, p. 972)

Some suggest that functional separation can take place at the level of 'primitives'. These can be thought of as quite specialized structures dedicated to a particular kind of recognition or conceptualization. The existence of primitives has been argued in contexts such as vision (e.g. Shams & von der Malsburg 2002) and motor control (e.g. Thoroughman & Shadmehr 2000; Todorov & Ghahramani 2003). Specialization can also take place a more general level, such as the clearly demonstrated involvement of the amygdala in many kinds of emotional response (Casebeer & Churchland 2003; Morris & Dolan 2004). Aron *et al.* (2004) argue for the localization of certain inhibitory responses in the right inferior frontal cortex. Many further examples could be cited.

Complicated cognitive tasks look likely to recruit a variety of regions and structures into their accomplishment. Indeed, some regions seem to specialize in functions that have quite general applicability, such as the conflict monitoring and resolving functions mentioned above. Such regions turn up over and over in a variety of imaging experiments, to the initial confusion of the researchers involved.

In the early days of functional imaging every task seemed to activate dorsolateral prefrontal cortex (DLPFC), and every experimenter was happy to define a different role for this region.

(Frith *et al.* 2004, p. 349)

In the hotly debated and controversial field of consciousness studies, some have recruited the recruitment idea as an explanation. This theory argues that what we experience as consciousness is the most extreme and general version of the recruitment strategy: a 'global workspace' that can marshal diverse resources in the brain to accomplish many tasks (Baars *et al.* 1998; Dehaene & Naccache 2001).

#### (c) *Understanding the strategic nature of mental tasks*

In pursuing the mix of modelling and empirical investigation that is at the core of cognitive neuroscience, the strategic nature of the mental task under consideration must be kept in mind. This is particularly true of mental tasks involving social relations among human actors. Traditional psychology recognized the 'actor-observer' paradox, describing the tendency for individuals to use different standards and approaches to judge their own actions as opposed to the actions of others (Duval & Wicklund 1972; Jones & Nisbett 1972; Taylor & Fiske 1975). More recently, Pizarro *et al.* (2003) have described empirical evidence for asymmetrical judgments of moral blame and praise depending on the perceived impulsiveness or considered nature of the decision. Although these kinds of double standards are widely condemned as hypocrisy, particularly when applied to benefit oneself, consideration of their strategic properties can help us to understand their occurrence.

Since the time of Adam Smith (1776), economics has correctly grasped the scale of beneficial pay-offs available to cooperative human actors. These pay-offs, and the barriers to successful cooperation posed by the opportunities of defection, are deeply imbedded in reality, and reoccur at several levels of organization in the history of living organisms (Maynard Smith & Szathmary 1995). Game theory provides a formal foundation for understanding the nature of these interactive relationships of human sociality (von Neumann & Morgenstern 1944; Binmore 1994, 1998; Fehr & Fischbacher 2004).

Games are not always symmetrical. The dynamics applicable to developing a solution for a player in one position may not be the same as those applicable to a player in a different position (McCabe *et al.* 1996, 1998, 2001). From a strategic standpoint, the answer to 'should Jane do x to John' may have a very different answer depending on whether you are Jane, John or a third party judge. It is fully possible that these different strategic dynamics could implicate different processing in the brain for what might, in its general description, be considered to be the same question. The importance of this kind of distinction is becoming better recognized in cognitive science (Camerer 2003a,b; Goodenough 2004).

#### (d) *Multiple sources of information*

A further complication embraced by cognitive neuroscience is the multiplicity of information sources available to the brain as it works to solve social problems. The possibilities start with our genetic information



heritage. Much of this is broadly shared across humanity (Jones 2001*b*), while some may be variable and specific to individuals, one of the sources of each person's unique temperament (Larsen & Buss 2002). Nor does genetic information realize itself in a vacuum. Through the process of epigenesis, genes do their job only in conjunction with a quantity of environmental information (Hinde 2004). People also have access to a rich variety of cultural knowledge transmitted in a complementary, coevolved stream with their genetic nature (Boyd & Richerson 1982; Goodenough 2002*b*; Laland & Brown 2002; Pigliucci 2003). This cultural knowledge may itself be implicit, like the unconscious social modelling that proceeds from childhood, explicit but popular, like sayings or literature, or explicit and expert, like the law. There is also information that is personal to the individual, such as the social circumstances of her life, the day to day events that she encounters, the physical nurture or injury she has received, and her behavioural interactions with family, friends, school, etc.

The components of this mix are commonsensical; the degree to which each plays a role in a particular aspect of human thought and action can be controversial (Goodenough 1997*a*). What is also commonsensical is that the brain is where the combination, comparison, sorting and choice of these disparate information and memory sources is made, perhaps within a process of different systems resembling that described by Kahneman, above. Indeed, one of the functions of our relatively competent human brains is to provide and weigh alternatives. When we overlay these multiple sources of information onto the multiple pathways of thought and onto the different possible strategic positions, we realize that human normative judgment is likely to be a complicated composite, and not a unitary process. The intellectual framework of cognitive neuroscience makes the problem of understanding normative judgment and its components more complex, not less. Fortunately, with the tools of cognitive neuroscience, we can begin to work through this complexity.

#### (e) *Methodological considerations*

The methods of cognitive neuroscience involve postulating and testing functionally based hypotheses about thought. These cognitive models are developed from several sources. Traditional taxonomies of our own experience can provide a starting point. For instance, the successful investigation of the colour processing systems of the brain grew from the generally accepted, experientially based notion that colour differentiation is an important element of sight (see Zeki 1999). Similar considerations apply to normative judgment: it is a process most humans experience at a subjective level on a regular basis, and the history of intensive speculation in philosophy, religion and law has clarified the subjective descriptions. Traditional sources such as these are not without their complications, however (Churchland 1991; Keil 2003). The intuitive models of cognition that this 'folkscience' provides should be tested and refined using the proven tools of experimental psychology. Other sources for creating cognitive models include the predictions of evolutionary psychology, the descriptions of traditional psychology, and the rapidly improving understandings of cognitive neuroscience itself.

The most common method for testing these models is to seek to differentiate closely related mental tasks where the

distinction between them is rooted in the hypothesis to be tested. The experimenter will seek to identify behavioural and physiological activity (or its absence) consistent with the hypothesis and inconsistent with its alternatives; if this activity is present (or absent) as predicted, the hypothesis gains support (Gazzaniga *et al.* 2002). The experimental tasks must be carefully designed to avoid, to the extent practicable, the presence of more than one possible source for any observed variation. Alternative possibilities are often called 'confounds', and undercut an experiment's validity. Avoiding this pitfall leads to a fundamental tension that cognitive neuroscience shares with other branches of experimental psychology. The pressure to remove confounding factors prompts researchers to strip away real-life contexts, thereby undercutting the 'ecological validity' of the targeted cognitive process. (Casebeer & Churchland 2003). Furthermore, for such cognitively complicated tasks as normative judgment, untangling the multiple processes and creating sufficiently targeted experimental tasks is inherently difficult (Casebeer & Churchland 2003).

Once the experimental tasks are set, they are given to subjects to perform, while the researchers collect a variety of data to see if there is a differentiation in physical reactions, behaviour or subjective experience that matches the hypothesized differentiation in the targeted experimental task. Investigating complex mental processes requires many different kinds of measurement. Some of these, often collectively referred to as 'behavioural data', are directly related to the performance of the task. This would include accuracy in answering and reaction time, both of which are linked to complexity of processing (Wilkinson & Halligan 2004). Self reporting on subjective parameters such as task difficulty or the severity of a transgression gives its own metric of differentiation that can be compared with the behavioural measurements. Other tools of this research include such psychophysiological measures as skin conductance (linked to degrees of emotional arousal) and pupil dilation (linked to task difficulty).

Direct physical inferences about brain function have been made for years using patients with damage to the brain resulting from injury, disease and developmental problems. These 'lesion studies' were at the centre of the early identification of some of the language areas in the brain, such as Broca's area and Wernicke's area (Finger 2000). More recently, patients with amygdala dysfunction have helped to investigate the role of that structure in emotion and emotion-linked processes (e.g. Anderson & Phelps 2001, 2002). Lesion studies have several limitations. Any ethical system of research on humans can only use naturally occurring deficits and must show sensitivity and restraint in dealing with an experimental population that is by definition mentally impaired. Furthermore, until the invention of imaging techniques that could identify deficits accurately in living subjects, the exact parameters of the injury of the subject could often only be established after death.

The invention of non-intrusive methods for spatially locating brain activity has been a significant addition to the experimental toolkit. Most prominent in recent work have been PET and fMRI. Both of these techniques give indirect measures of brain metabolism, allowing the identification of brain areas active or inhibited in mental tasks (see Friston 2004). PET uses the radioactive decay of a tracer added to the blood to provide its measurements, whereas

fMRI uses the so-called BOLD signal as the basis for its measurements. In each case, the link of blood flow to functional work in the brain has been established, but subject to limitations and qualifications (e.g. Mechelli 2004). Increases in the fMRI BOLD signal lag after the onset of activity (as measured by electrical activity) by a relatively predictable 3–6 s, peaking at 5 s (Posse *et al.* 1996; Hensen 2004). Both techniques require the subject to lie immobile in a large magnet where it is awkward to present tasks and measure other responses. The fMRI, with its strong magnetic field and high level of noise, is particularly claustrophobic and distracting. Notwithstanding these difficulties, inventive researchers have developed clever means to present tasks and collect data with a high degree of reliability.

It is important for a non-specialist faced with imaging data to understand what it does—and does not—mean. First of all, the pretty pictures of ‘brains lighting up’ are actually artefacts of extensive analysis and selective presentation. In fact, at any given time of wakeful activity, many, perhaps even *all*, areas of the brain are active to some degree. The pictures show a colourful projection onto a model brain of the regions in which some statistically significant level of increase or decrease in the measurable phenomenon (blood flow) has occurred compared with a control state, often on some kind of accumulated basis over several subjects. They are *not* direct pictures in any meaningful sense.

Second, the relative activation of a particular region of the brain in the performance of a task compared with the differentiating task does not tell us that much by itself. This information is only ‘spots on brains’ until it is related to the target hypothesis and to the developing picture of cognitive localization and integration in the brain. A particularly nice way of linking imaging data with the targeted cognition involves establishing some kind of intensity measure for the activity in the behavioural data and demonstrating a corresponding change in intensity of response in the imaging data.

Third, the degree of spatial resolution in such images, although good and getting better, is still at a scale far coarser than the identification of particular neurons or groups of neurons (Casebeer & Churchland 2003). Finally, as with any of the experimental techniques of cognitive neuroscience, the imaging data are only as good as the underlying tasks given to the participants and the subtractions or other techniques based on these tasks allow it to be. Imaging techniques are powerful tools, but their results are not always well presented or understood.

Other techniques for measuring and localizing brain reactions include such measures of electrical activity as the EEG and MEG. These provide excellent temporal resolution of brain response (Gazzaniga *et al.* 2002).

Neurochemical studies are also an important component in the methodological mix. Although somewhat eclipsed by the recent prominence of imaging in the public and scientific imagination, neurochemistry is a necessary part of any complete functional description of brain activity (e.g. Masters & McGuire 1994; Coull & Thiele 2004). The link of serotonin and depression, although not fully understood, has been established both in science and the popular consciousness, as Robert Wright’s *Slate* posting ‘Is Prozac driving Wall Street’ fully illustrates (Wright 2000). In considering the effect of emotion on mental processes, both the

general neurochemical climate of the brain and the relative presence or absence of particular neurotransmitters are important elements (e.g. Henry 1986; Panksepp 1993).

All of these methods work best in concert with one another (Humphreys & Price 2001; Parsons 2001; Wilkinson & Halligan 2004). The profile of a fully developed field of research in cognitive neuroscience includes specific hypotheses about well-defined mental processes, a growing body of functional locations and systems linked to these hypotheses, and the support of data from behavioural experiments, lesion studies and activity measurements through imaging and other localizing techniques.

#### 4. NORMATIVE JUDGMENT IN THE BRAIN

Against this historical, theoretical and methodological background, we can turn to the central piece of this essay: a summary of the current ‘state of play’ in the neuroscientific approach to normative judgment in humans. We will first examine the model for normative judgment now animating this research, then turn to a review of lesion and imaging studies that are testing this model and its variations. Finally, we will seek to evaluate where the field is and make some predictions about where it is headed.

##### (a) *The consensus model and its variations: emotion and intuition play important roles*

The current work applying neuroscience to normative thinking has largely rejected the Kant/Kohlberg conception of normative judgment as properly seated in the realm of affect-free, rational, conscious thought. Rather, models emphasizing the role of emotion and intuition in moral judgment have been developed (Damasio 1996; Pizarro 2000; Haidt 2001, 2003; Nichols 2002; Casebeer & Churchland 2003). The social intuitionist model advanced by Haidt (2001), for instance, posits that fast, automatic and affective intuitions are the primary source of moral judgments. This article tellingly refers to an ‘emotional dog and its rational tail’ in its title. Haidt views moral judgments as evaluations (good versus bad) of the actions or a character of a person that are made with respect to a set of virtues held to be obligatory by a culture or subculture. In this model, conscious deliberations play only a minor causal role and are used principally to construct *post hoc* justifications for judgments that have already occurred.

##### (b) *Concerns I: overvaluing emotion and intuition?*

The emerging consensus raises its own concerns. Whereas we agree strongly with the importance of giving proper value to emotion and intuition in many forms of normative judgment, we are concerned that the pendulum may swing too far, and that cognitive processes at the reasoning end of the spectrum will undervalued. We believe that the best view of normative judgment is that it has both cognitive and affective aspects. The cognitive aspect contains factual knowledge about accepted standards of social and moral behaviour (norms and values) and rational reasoning processes. The affective aspect includes the experience and effects of emotions like guilt, sympathy, shame and anger if social or moral norms are violated. While, as Casebeer & Churchland (2003) put it, ‘good moral cognition is shot-through with emotion’, it is not purely emotion, either.



The totality of the evidence suggests that normative judgment consists of one or more sets of higher mental abilities, which in turn rely on a variety of disparate cognitive and affective processes, such as understanding of a situation, appraising its emotional valence, activating norms from long-term memory, maintaining a norm in working memory, comparing the norm with the present behaviour, and deciding if there is any transgression, all of which take place under the influence of emotional processes. Therefore the neural basis of normative judgments is likely to involve several brain systems and to be distributed across the large portions of the brain. That said, it is also possible that there may be dedicated elements—perhaps even primitives—for certain aspects of the process. This possibility receives some support from the work of Cosmides (1989). She presents evidence of enhanced competence in performing a logic task if the task is presented in the form of a cheater-detection story. The presence of such relatively specialized elements as components in the process would not conflict with the view of normative judgment as a complex, widely distributed system or systems.

**(c) Concerns II: a better model of emotion**

There is an even more fundamental difficulty with the consensus view. Notwithstanding the significant attention devoted to emotion and intuition in recent years, there is still a lack of clarity as to what they consist of in the brain (Posner 2001). It was an enthusiast for the role of emotion in normative judgment who recently admitted ‘that emotion theory and research is immensely complex and that the role of the emotions in behaviour, including social judgments, is highly variable and context dependent’ (Feigenson 2000, p. 447). An American judge once described the state of the law of privacy as a ‘haystack in a hurricane’. Current scholarship on emotion comes close to deserving this label. Certainly the words ‘heated debate’ can be reasonably applied to several of its issues.

In the context of moral thought, Haidt (2003) takes a good stab at bringing some order to the field. He suggests some useful distinctions, sorting moral emotion into other-condemning emotions (contempt, anger and disgust), self-conscious emotions (shame, embarrassment and guilt), the other suffering family (sympathy and compassion) and the other praising family (gratitude, awe and elation). As satisfying as such a list can be, it still remains at heart a working hypothesis, and not yet a tested conclusion.

The authors believe that progress will be made by separating ‘emotion’, the sensation of arousal that we monitor in ourselves and others, from ‘emotion’, the functional component in mental processes. Its meaning as a sensation state strikes us as being less important to normative judgment than are the functions which the-thing-we-call-emotion-when-we-experience-it is contributing to the processing of normative tasks. In this functional sense, steady progress has been made by experimenters plugging away in a variety of contexts (e.g. Rolls 1999; Dolan 2002; Phelps 2002; Morris & Dolan 2004). These disparate results suggest that emotion acts as a great emphasize and highlighter in the brain, an indicator of importance and urgency. Damasio, for instance, has suggested that emotion plays a key role in creating a ‘somatic marker’ which helps guide and prioritize decision-making processes

(Damasio 1994). In the realm of memory, events that are associated with emotional states are much more likely to be transferred from working memory to long-term recollection (Morris & Dolan 2004). In the current brain, emotion drives attention towards its associated objects (Anderson & Phelps 2001). Emotion gets us up and doing. As even Hume recognized, emotion is a great translator of thought to action (Hume 1739; Rolls 1999; Schwartz 2000).

Perhaps it is not so much that emotion is a key to normative judgment as it is a key to important and effective normative judgment, normative judgment that gets our attention and gets translated into action, either with respect to our own conduct or to the reward or punishment of others (Fehr & Gächter 2002). Part of the emotion controversy revolves around how far this idea can be taken: the extent to which emotional processes influence cognition, whether fully affect-free cognitive processes exist at all, and whether we would notice them if they did, are all undecided questions (e.g. Damasio 1994, 1996, 1999; LeDoux 1996). There is evidence that emotion—or at least its frequent physical component the amygdala—is deeply and necessarily involved in social judgments (Phelps 2002).

In our view, the consensus theoretical model of moral judgment properly includes emotional involvement as an essential component. There remains, however, significant work in clarifying and testing the role or roles of this component. Furthermore, as we will argue in § 5, this component may produce consequences that the law may wish to guide and contain through the recruitment of other systems of thought.

**(d) Concerns III: a better model of intuition**

In our discussions so far, we have to some degree conflated intuition with emotion in discussing normative judgment. Although we are not alone in this, it is probably a mistake. It is possible for humans to make intuitive judgments about the world that have a low level of emotionality (Camerer *et al.* 2004). Consider taking an uneventful automobile drive over a familiar road or making intuitive judgments about simple grammatical errors. Put simply, intuition is a concept we use to describe mental processes that are not directly accessible to conscious monitoring or participation. Viewed this way, the property of intuition has more to do with the boundaries of self-awareness than it does with the actual competence or incompetence of the mental processes so labelled. There is no reason to suppose that intuitive processes are simple or inaccurate just because they are not directly involved in conscious thought. We certainly will not solve the problem of consciousness in this paper, but we can help de-stigmatize intuition through such a definition.

What remains interesting is the insight, going back to Hume and beyond, that certain important categories of normative judgment fall into this description. In this dimension they resemble emotional states, but they are dissimilar in other ways. The role of intuition in the study of morality may be more important for supplying a marker for some of the systems involved or cognitive mechanisms behind it than for telling us anything inherent about the properties of their processing.

**(e) Lesion data**

In the past decade, researchers have begun to bring real data to the study of the normative judgment in the brain. Initial attention concentrated largely on lesion data. The specific moral deficits resulting from brain trauma reported in contemporary injury studies (e.g. Anderson *et al.* 1999; Dolan 1999; see also Damasio 1997; Angrilli *et al.* 1999) and in historical patients such as the widely publicized Phineas Gage (Damasio *et al.* 1992), lend support to the proposition that at least some of the processes and structures involved in normative reasoning are dissociable from more general problem solving abilities (Casebeer & Churchland 2003). Most of these studies point to regions in the prefrontal cortex as critical components in the formation and application of socio-moral reasoning (Casebeer & Churchland 2003). More specifically, orbitofrontal deficits have been linked to difficulties in cuing morally appropriate behaviour, and in learning moral information. Indeed, the age at which the injury occurred in this region has also been shown to have an effect on the degree and nature of the normative deficits (Anderson *et al.* 1999; Casebeer & Churchland 2003; Pigliucci 2003). Recent work on lesion patients shows orbitofrontal involvement in anticipating consequences and experiencing regret (Camille *et al.* 2004).

**(f) Imaging studies: evidence for complex cognition**

In the past 4 or 5 years, a flurry of fMRI studies has investigated the neural basis of normative judgment (Greene & Haidt 2002; Greene *et al.* 2001; Moll *et al.* 2001, 2002a,b, 2003; Heekeren *et al.* 2003, 2004). Although it is possible to raise methodological concerns about some of these studies, it is important to recall that they are pioneering efforts. The experiments take quite variable approaches. For instance, some used complex dilemmatic scenarios (Greene *et al.* 2001), others more simple ethical decision-making tasks (Moll *et al.* 2001, 2002a,b; Heekeren *et al.* 2003, 2004). Greene *et al.* (2001) set its dilemmas in an imaginary first person, asking what the subject would do. The others asked the subject to act as a third-party judge. The possible effects of the strategic differences between these two positions were not fully envisioned. Furthermore, the emotional content of the studies varied greatly. Some asked questions involving death and other highly emotional situations (Greene *et al.* 2001; Moll *et al.* 2002b), whereas others posed less fraught judgment problems (Moll *et al.* 2001; Heekeren *et al.* 2003). All of the studies requested their participants to undertake what were in effect intuitive judgments. None asked that they learn or apply any explicit set of normative rules. Finally, some of the studies showed variation in the behavioural data that supported the imaging findings; others did not.

Given these difficulties and differences, it is remarkable that these studies, taken together, point overall to a common system that may very well form the neural substrate of normative judgment: ventromedial prefrontal cortex, orbitofrontal cortex, posterior cingulate cortex and posterior superior temporal sulcus. This is not a full triumph, however. The components of this network of brain regions are each active during several tasks, e.g. control of behaviour, processing of socially relevant cues, memory and processing of emotional stimuli (Greene & Haidt 2002). Rather than identifying a 'moral centre' of the brain,

what we are seeing so far is moral judgment as a cognitive-affective process building on several contributing components (Casebeer & Churchland 2003). The challenge of seeking to disentangle the different cognitive and affective processes contributing to normative judgment is certainly important, but as Greene & Haidt (2002, p. 523) suggest, '[...] if one attempts to 'deconfound' moral judgment with everything that is not specific to moral judgment (emotion, theory of mind, mental imagery, abstract reasoning, and so on) there will almost certainly be nothing left'.

If the identification of these regions and the conclusions flowing from it holds up in further experimentation, the challenge for understanding intuitive normative judgment shifts, at least in part, from one of localization to one of integration: can we better understand how these different brain systems act together to perform such a complicated task? Careful experimental manipulation and differentiation of the components contributing to moral judgments and of the processes through which they work together will be necessary to construct a better description of how moral judgment works in the brain. A comparison with other kinds of judgment tasks, such as evaluative judgments on simple preferences (Zysset *et al.* 2002) and grammatical judgments (Wartenburger *et al.* 2003), may also prove productive.

In addition to establishing a target system for intuitive normative judgment, many of the fMRI studies found that brain regions linked with emotional processing are also active during moral judgments (Greene *et al.* 2001; Moll *et al.* 2001, 2002a,b; Heekeren *et al.* 2003; for review see Greene & Haidt 2002; Moll *et al.* 2003). As in the lesion data, the orbitofrontal cortex was often implicated. This structure receives a direct projection from the amygdala (Morris & Dolan 2004), with its established roll in the emotions and social judgment generally. These findings support the model that emotion plays a role in normative judgment, or at least in the kinds of normative judgment posed to the subjects in these experiments.

**(g) Conclusions on current theory and research**

Current work on the application of neuroscientific methods to normative judgment has made significant progress, both at the level of modelling and theory, and at the level of functional mapping. Work so far is consistent with the idea that normative judgment consists of systems involving several sub-processes, which frequently include an emotional component. We may still be in the early days of this effort, but we are well started along the road. A clearer set of models, based on results so far and a fuller understanding of the roles of emotion and intuition, and a better use of traditional behavioural measures in conjunction with imaging, will help speed further progress.

## 5. A MODEL FOR LAW: RECRUITMENT ACROSS THE COMPOSITE

So far in our story, neuroscientific examination of normative judgment has been modelled to recognize the importance of emotion and intuition. With respect to naive, personal judgments—Hume's moral sense—we agree that this focus is appropriate. We do not think, however, that it reveals the full picture of how humans can and do attack problems of judging right and wrong. The emerging picture of normative judgment suggests interrelated sets of

capacities, drawing on multiple sources of information, to solve strategic dilemmas of expectation, reliability and punishment. As we have seen, cognitive neuroscience acknowledges that there are potentially several processes and several information sources that may be recruited to perform a particular mental task.

We suggest that the law is an example of just such a recruitment system, one that is located not only in the internal processes of the brain but at least in part in the external mediums of language-based culture. In this view, law is potentially the most complete and competent avenue for normative judgment, combining both of Kahneman's systems, as it were. Law makes possible the kind of complex societies that would be impossible if we could only rely on our evolved 'primary equipment', characterized by intuition and emotion, to provide the rules and responses of normative judgment. Kahneman & Frederick (2002, p. 50) remind us that intuition is not the end of the story, 'because intuition can be overridden or corrected by self-critical operations, and because intuitive answers are not always available'.

Law is neither all reason nor all emotion; it is neither all explicit rules nor intuitively accessed principles of justice; it is a composite. In some instances, such as the American standard for determining negligence, law makes an explicit appeal to intuitive processes of risk assessment and avoidance, asking the question what would a 'reasonable person' have done in a like circumstance (Restatement 2nd of Torts, § 283). In establishing the requirements for the waiver of a warranty on goods sold in normal commerce, law provides an explicit, word-based rule in the Uniform Commercial code (§ 2-316) that operates through deductive logic application.

In determining culpability and meeting out punishment, the delay inherent in procedures of criminal law can intercede to prevent the quicker action of emotion driven judgments of immediate justice. Although some emotional content is probably inevitable and necessary in reviewing criminal allegations, letting the quick, intuitive and emotional impulse to punish dissipate before judgment and action take place may lead to preferable results in a complex society. Lynching is a quick phenomenon, 'shot through' with emotion. Left to their own devices, the operation of the intuitive, emotion linked, primary punishment impulses can lead to escalating tit-for-tat retaliation cycles, whether the actors are the Hatfields and the McCoys of US feuding fame (Waller 1988) or US military jailors and Iraqi militants in Baghdad. Legal process provides different pathways for normative judgment that can lead to superior strategic solutions for all concerned. In this context, legal process acts in the role of Kahneman's second system, working with the strengths of the first system but stepping in as well to correct its failings.

We believe that law is uniquely situated to move back and forth throughout the entire composite of brain capacities, strategic positions and information sources. Sometimes the law will empower or act in concert with emotion, both to make use of the best aspects of emotion-driven judgment and to preserve law's emotional validity to its subjects (Deigh 1999). At other times law will filter certain emotions out (Nussbaum 1999). Although the law will not always be successful in constructing better solutions to the opportunities and challenges of sociality and

cooperation, the well-demonstrated relationship between a reliable rule of law and high levels of economic growth (Zak & Knack 2001) suggests that legal systems are having some success in providing solutions with better outcomes than intuitive systems alone could provide.

#### (a) *Can we test this model?*

We believe that this model can be tested. After all, the law is a rich source of cognitive and behavioural data. Its taxonomies are not simply 'folk science' (Churchland 1991; Davies & Stone 1995; Keil 2003). Law is, in its own way, an investigative science, a learned and academic discipline which probes into the nature of human thought (Langdell 1887; Goodenough 2001a). The classic legal process of seeking to articulate the mental landscape on issues of right and wrong into word-based rules is a rigorous intellectual exercise, relentlessly tested back against reality in hundreds and thousands of *in vivo* experiments: actual human disputes (Goodenough 1996). Although such data are not 'scientifically' controlled in the traditional sense, generally recognized distinctions in the law represent widely held, cited and tested approaches, which have their own empirical validity as a starting point for investigation of the psychology and mechanisms depicted (Goodenough 2001b). Just as moral reasoning studies can start with the reason-intuition distinction, we suggest that the widely recognized law-justice dichotomy is sufficiently well established through legal scholarship and application to justify using it as a testable hypothesis.

#### (b) *Empirical approaches to law and justice in the brain*

Unlike naive normative judgment, law and justice have not yet sparked broad neurobiological research activity. One of us (O.R.G.) has participated in preliminary fMRI work seeking to compare the activations of subjects, using in some instances their intuitive sense of justice, and in others a legalistic rule to judge manufacturer blame in product injury scenarios. The rule in this experiment was in the form of a deductive syllogism. Initial results (Schultz *et al.* 2001) showed differences between the law and justice conditions and implicated orbital frontal and prefrontal regions for the justice condition: results generally consistent with the fMRI experiments on moral reasoning described above. Unpublished results using a larger sample and random effects analysis (J. Schultz, O. R. Goodenough, R. Frackowiak and C. D. Frith, unpublished data) suggest that performing the legal rule task recruits regions in the right parietal cortex, an area that has been implicated in other studies of deductive logic tasks and in the 'mental model' theory of deductive reasoning (Goel *et al.* 2000; Goel & Dolan 2001, 2003; Parsons & Osherson 2001; Knauff *et al.* 2003). Although only a start, this finding provides some initial support for the recruitment hypothesis of law.

## 6. POSSIBLE APPLICATIONS TO PROBLEMS OF LEGAL DESIGN AND ENFORCEMENT

So far, our discussion of the application of neuroscience to law has been at a highly theoretical level. Law as a discipline, however, is generally less interested in abstract knowledge than in the solution to very particular problems. 'What can you do for me today?' is law's motto. We believe



that an understanding of the brain and the application of cognitive neuroscience has a lot to offer in addressing concrete concerns of legal doctrine and administration. In this final section, we will discuss two potential topics at the intersection of law and the brain that are of particular interest to the authors: (i) the effect of emotional arousal on jury decisions of culpability; and (ii) the ineffectiveness of intellectual property laws to inspire widespread voluntary compliance.

**(a) *The effect of emotionally arousing evidence on jury decision making***

The rules governing the admissibility of evidence in a trial in the USA are generally aimed at filtering out evidence of low reliability or low probative value. One class of rules, however, is aimed at excluding evidence that might be both reliable and probative, but which would also be *prejudicial*. One codification of this approach is 'Rule 403' of the Federal Rules of Evidence. It provides:

Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

Tanford (1989, p. 831) sums up the concerns that animate Rule 403: 'if evidence threatens to frustrate [the objectives of a fair trial], by wasting time, confusing the issues, or *arousing the emotions of jurors* [emphasis added], it should be excluded'. A typical context for arguments over this rule is the desire of a prosecutor to show the most gruesome available pictures of the corpse and crime scene in a murder trial to establish the facts of the crime and the desire of the defence to keep them out.

It could be argued that this rule reflects the fundamental assumption in reason-valuing philosophy, psychology and law that emotions and cognitive processes are antagonistic and that emotions are detrimental to sound moral reasoning and moral judgment (Posner 1999, 2001). The rule could also be justified not as a denial of the importance of emotion, but rather as its validation. The underlying assumption here is that emotional loading can be so powerful that it simply becomes the dominant influence, and may lead to results unrelated to the underlying truth or falsity of the criminal accusation. Jury instructions that commonly tell jurors not to be influenced by emotion (Feigenson 1997) raise similar questions.

The role of emotion in a Rule 403 context is an empirical question, and one that has not been sufficiently tested. As Posner, no friend of emotion in judgment, puts it:

the law has an elaborate set of doctrines for fending off dangerous intrusions of emotion into the judicial process .... A proper understanding and critique of these rules [of evidence] might profit greatly from a careful examination of them in the light cast by the systematic study of the role of emotions in law.

(Posner 1999, p. 327)

Feigenson, who is a friend of emotion, writes:

Those inclined to take emotions in law seriously need whatever guidance empirical research can offer about how particular emotions work, what stimuli provoke them, and what effects they are likely to have on the various processes of legal judgment, so that they may think most productively about whether and how the law should respond to those emotions.

(Feigenson 2001, p. 457)

Studies by Bodenhausen *et al.* (1994*a, b*) have shown the influence of emotions on social and quasi-legal judgements in the context of stereotyping. A recent study in which one of us (K.P.) participated (Heekeren *et al.* 2004) investigated the effect of the presence of violence on simple ethical and semantic judgments. We found that presence of violence during moral judgments (but not during semantic judgments) lead to significantly reduced response times and higher immorality ratings, i.e. an interaction of content and task.

We would like to follow up on this approach, first of all to collect expanded behavioural data on the impact of unrelated emotional loading on moral judgment and secondly to clarify how a change in amygdala activity modulates other brain regions engaged in the judgment process (ventromedial prefrontal cortex and posterior superior temporal sulcus) and in which temporal sequence. Such an investigation will require the combination of fMRI with psychophysiological tools of measurement, such as skin conductance and pupil dilation, and/or other brain imaging modalities such as EEG or MEG (cf. Dale & Halgren 2001). We believe that a better understanding of these processes will help guide courts as they interpret Rule 403.

**(b) *Investigating processing differences between property and intellectual property law***

Intellectual property law provides a second example of a programme for possible research based in a neuroscientific approach to legal problems. Intellectual property is becoming increasingly important around the world, and considerable progress has been made in defining the explicit rule structure in both domestic and international law (e.g. Ryan 1998; Merges 2000; Mossinghoff 2000; Goodenough 2002*a*). The problem of promoting *compliance* with these improved legal structures has proved less tractable (Goodenough 2002*a*). This is true not only in such countries as Russia (e.g. Miller 2000) and China (e.g. Allison & Lin 1999; Fan 1999), but also in the USA as well, as widespread music copying through the Internet demonstrates (e.g. A&M Records Inc. versus Napster Inc. 2000, 114 F.Supp. 2d 896 (N.D. Cal.); A&M Records versus Napster Inc. 2001, 239 F.3d 1004 (9th Cir.)) (Landen 2001; Green 2002; see generally Lehman 1995).

To some extent, improved compliance can be produced by better top-down enforcement. The well-publicized campaign by the industry in 2002 to sue grandmothers and teenagers for illegally downloading music files has had some success in diminishing really blatant copying (Colletti 2003; Morrisey & James 2003). The recent adoption by the European Union of a new Intellectual Property Rights Enforcement Directive has extended the possibility of such a campaign to Europe (Lillington 2004).

But compliance rests as much in the expectations and inhibitions of the individuals in society as it does in the adoption of statutes and directives. The very technology that makes information valuable makes copying trivial and nearly undetectable, and for many, many people there is no subjective feeling that such taking is really culpable. Why do people who would feel guilt over taking a pencil happily copy programmes, songs and films without a qualm? Our admittedly anecdotal experience suggests that those cheerfully making illegal copies can often tell you, without any embarrassment, that copyright law exists. It just doesn't

change their behaviour. On a very basic level, these copiers do not seem to think that this kind of behaviour is *really* wrong.

Our hypothesis is that there is little or no affective component to the understanding of intellectual property in these people. To be effective, a programme to promote intellectual property compliance must not simply make people aware that such laws exist; it must also convince people that the violation of such laws is a serious injustice, invoking the emotional systems in the brain related to such a response (Goodenough 2002a). As Casebeer (2003, p. 846) concludes, 'emotion, reason and action are bundled together'.

In proposing this idea, we are turning our recruitment conception of the law back on itself. The ability to recruit passionless processes may be an advantage in some contexts, but it can also be a problem if carried too far. We suggest that some rules—such as our taboos on the theft of tangible objects—exist both in our articulated codes and in our emotionally and intuitively grounded sense of justice. Such rules are likely to be highly internalized in members of society and to evoke the kind of emotional response that will lead to general acceptance, personal observance and vigorous enforcement. In other cases, there may be laws that make excellent sense from an abstract 'policy' standpoint, but which have little support in the mental processes associated with the sense of justice, with predictable results. Our system of intellectual property may be such a case.

Why might there be an emotional deficit at the heart of copyright law? Two possibilities suggest themselves. Some would argue that it is just a matter of education, experience, socialization and fear of punishment. This was the suggestion of the 1995 Working Group on Intellectual Property Rights of the Information Task Force, which suggested that ignorance and confusion were at the heart of the compliance problem and advocated popular education about the law (Lehman 1995). Another possibility is that the mental differences arise from some more fundamental, perceptual differences that implicate an emotional involvement in perceptions about the theft of tangible property but fail to do so for intellectual property. How could this come about?

One answer lies in the important strategic differences between tangible property and intellectual property. Although the solution of assigning ownership in an asset to a particular person is similar, the presenting problem that this is called on to solve is different. Current explanations for the evolvability of property focus on the utility to all players of ownership conventions to defuse rivalry over limited and consumable resources (Maynard Smith & Parker 1976; Stake 2004). Such conventions do not depend on any existing relationship between the parties, but rather an identification between the one of the parties and the resource in question.

It has frequently been noted that intellectual property is not a 'rivalrous' resource. When someone reads a book or listens to a song, that generally does not consume it and exclude someone else from doing the same thing (e.g. Wagner 2003), although there are circumstances where information use can be competitive (e.g. Aviram & Tor 2004). Rather, protecting intellectual property is more in

the nature of secret keeping, or holding to a binding promise (Goodenough 2001b). In such a context, inhibitions on exploitation and use *do* depend on a relationship between the parties.

It is plausible, if still only a hypothesis, that these strategic differences are represented as cognitive primitives at some point in the recognition of the moral dilemma. If so, we could further imagine that the primitive for a property structure works best with a tangible object and (perhaps) land. Although property may be a good theoretical solution for allocating rights in intangible products of the intellect, it may be that the perceptual equipment of the human brain is simply not set up to recognize them as proper objects for emotionally reinforced normative judgment.

Such a model is currently only speculation. Nonetheless, it has the potential for testing by applying the methods of cognitive neuroscience. Theory arguments suggest that such a difference might exist. From the standpoint of lesion data, we are not aware of any reports of differential property-observing deficits that would support the idea of a property primitive. Nonetheless, such deficits could be masked by other cognitive capacities picking up the slack, i.e. property for the lesion patient becomes more like intellectual property in the rest of us. Given the economic and societal importance of the subject matter and the possibility that expanded knowledge can help shape more effective policy, we believe that this is a legal concern that could repay systematic exploration, using all the tools of cognitive neuroscience.

## 7. CONCLUSIONS

The study of normative judgment through the methods of cognitive neuroscience is appropriately hot. Although the discipline is only in the early stages of a complex programme of investigation, we have already seen progress arising from an improved consensus model and data collection using imaging and lesion studies. Normative judgment is well on the way to being a well developed branch of neuroscientific studies. We suggest, however, that there is still some lack of clarity in the underlying modelling of normative processes, and believe that further work, particularly on the nature of emotion and intuition, will yield even better results.

The neuroscientific inquiry into law and justice is in a much earlier phase. A neuroscientific approach, however, has suggested a model for the law involving the broad recruitment and deployment of different systems of mental capacities and sources of information. We can also identify specific areas where neuroscientific methods and data may be of interest to law and policy. There is a great deal of detailed, interdisciplinary work to do; there is also the promise of significant advances to be made.

We thank the Gruter Institute for Law and Behavioral Research, and in particular its executive directors, Monika G. Cheney and the late Margaret Gruter, for their encouragement and financial support for the work reflected in this essay. We thank Paul Zak for his suggestions on an earlier version of this essay. We are also deeply grateful for the learning, advice, collaboration and experimental support of the Berlin NeuroImaging Center, particularly Professor Dr Arno Villringer, its director; Dr Hauke Heekeren; Dr Isabell Wartenburger; Professor Dr Elke van der Meer (psychology); Dr Hans-Peter

Schwintowski (law) also of Humboldt University and of the Wellcome Department of Imaging Neuroscience at University College London; particularly Dr Johannes Schultz, Professor Chris Frith, Professor Semir Zeki, Professor Ray Dolan and Professor Richard Frackowiak.

### ENDNOTE

<sup>1</sup> The relations among religious belief, cognitive processes and brain function are themselves targets of scientific study (e.g. Boyer 2003).

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## GLOSSARY

- BOLD: blood oxygen level dependent  
 EEG: electroencephalogram  
 fMRI: functional magnetic resonance imaging  
 MEG: magnetoencephalogram  
 PET: positron emission tomography