

# Workshop

## Neurological Basis for Justice

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In a gathering hosted by the Gruter Institute on November 16, 2001, lawyers, neuroscientists and economists converged at the University of California, San Francisco to discuss the intersection of justice and neuroscience. The day's sessions flowed from a primarily neuroscientific perspective which outlined the neural circuits involved in generating emotion, to presentations which discussed notions of how cognitive and affective processes contribute to decision making, and how the interplay of those brain systems should affect the structure of the law. The neurological basis of justice casts a broad net indeed. Nonetheless, discussion nucleated around central issues and returned to these themes again and again. These themes included how conscious versus unconscious processes shape behavior, and consequently, how accountability and responsibility ought to be viewed within the context of the law and within the context of neuroscience.

Welcoming remarks by Dr. Margaret Gruter traced her personal search for the meaning of justice, and her efforts to carry that search across academic boundaries. University of California at San Francisco (UCSF) host Dr. Michael Stryker expanded upon these remarks by highlighting the many strands of neurobiological research that bear upon notions of justice including — what drives decision making, how emotions are generated, and how the brain is (or isn't) plastic. In his brief overview, he noted that for many brain regions, experience is most effective in shaping brain circuits during a limited developmental critical period, and raised the interesting possibility that this might also be true for developing higher-order faculties, such as a sense of justice.

The first talks of the morning session laid the groundwork for discussing the brain structures responsible for generating emotion. Dr. Joseph LeDoux, New York University, stressed the scientific gains to be had by grounding the study of emotion in the measurement of discrete, quantifiable animal behavior — an approach that has not been usual in a field in which efforts to understand emotion have in the past taken introspection as their starting point. While emotional responses and conscious experience may be downstream of the same neural events, the latter is clearly not necessary for the former — it evolved later and the two are anatomically dissociable. This provoked a lively discussion: it suggests, in the context of constructing a sense of justice, that we simply don't have access to many of the neural events that shape our moral compass.

In a three part presentation, Dr. Howard Fields (UCSF) outlined the neural processes that underlie pain — starting with its transmission from the sensory periphery (e.g., a burned finger) to the brain, the nature of pain representation in the brain, and finally, how pain motivates behavior. Fields argued that one of the purposes of the brain is to represent the sensory world, and this representation may extend to generating our experience of the world: arguing, in effect, that while a pinprick to a finger is undeniably injury done to the finger itself, the experience of the pain which results resides in the brain, not in the finger. Segueing from the neuroscience of

pain to that of pleasure, Fields noted that addiction studies suggest that exposure to addicting drugs can produce enduring changes in portions of the brain that are centrally involved in decision-making, particularly the prefrontal cortical areas. The question this prompts — should the law make special allowances for these people, if indeed their responsibility for their actions is compromised by brain pathology — sparked a discussion that centered on the justice of holding individuals legally accountable for actions that are beyond their control.

Professor Albert Alschuler (University of Chicago Law School) posed a justice Gedanken which hinged on making an assessment of the fairness of using racial profiling in three different contexts. While discussants largely converged in their judgement of which context provided the most just cause for using profiling, Alschuler emphasized each participant's compulsion to rationalize a sense of fairness. This compulsion, he argued, represents a decision-making process in which experience is used to create moral judgements. A sense of right or wrong is, he argued, the product of conscious evaluation and experimentation can be developed systematically through introspection.

The second morning session centered around decision making — how brains make decisions, how individuals make decisions, and how cultures make decisions. Dr. Paul Glimcher (NYU) introduced his neurophysiological studies of decision making by introducing the traditional view of the brain: as a machine designed to transform sensory input into motor output, with brain loci at successive stages of this sensory – motor continuum which facilitate the progressive transformation. This view is outmoded, he argued, and fails both to account for the richness of behavior which even simple organisms demonstrate and for the very multi-modal (both sensory and motor) nature of many brain regions. Instead, the nervous system is likely making choices about behaviors by making estimates of the payoff – (how large is the payoff, and how likely am I to get it?)— offered by each behavior. Using experiments designed to hold sensory and motor tasks constant, while varying the payoff of a behavior, Glimcher found that neurons in a particular region of the monkey brain track this payoff. This talk elicited a lively discussion of free will. Glimcher maintained that the concept of free will was extraneous, and that all behaviors, given the animal's knowledge and goals, both "reflexive" and "voluntary," may be subserved by the same brain areas producing an estimate of optimal behavior.

The session was completed by talks that followed similar thematic lines. Professor Dr. Paul Zak (Claremont Graduate University) proposed that the successes of economics models in explaining behavior driven by self-interest fail to extend to a rich class of decision-making strategies (e.g. - decision-making that incorporates trusting behavior). He has designed experiments that use functional imaging and hormonal measures, correlated to measures of trusting behavior, to probe the substrates of biological systems involved in trust. Professor Dr. Kevin McCabe (George Mason University) described a positron emission topography (PET) study testing whether different risk strategies adopted in gain versus loss situations are mediated by distinct brain regions.

The third and final session of the day focused on the nature of brain representation, in its broadest sense. Professor Dr. Semir Zeki (University College London) outlined the way in which the brain acts on visual information, representing progressively more abstract features of visual stimuli in successive brain regions. The law, he proposed, is itself an abstraction, which may,

like purely sensory information, be represented in the brain by serial abstractions. If so, learning more about the brain's own rules for moral reasoning may lead to a less subjective standard of justice. This knowledge is very likely to change our standards of fair punishment as well. Lively discussion followed Zeki's proposal that our growing understanding of the neurobiological bases of some compulsive, criminal behaviors (e.g., pedophilia), suggests that punishing people suffering such conditions is neither effective nor particularly humane. Rather, the law must recognize the biological substrates of these compulsions, and, perhaps, discard the notion that punishment can alter such behaviors.

Improved brain imaging techniques have been a powerful engine driving exploration of human brain function. Professor Dr. Arno Villringer (Neuroscience, Charité, Berlin) presented a valuable primer of methods used for imaging studies, focusing particularly on functional magnetic resonance imaging (fMRI), a technique for non-invasively measuring changes in cerebral blood flow, which offers excellent spatial but limited temporal resolution. Professor Oliver Goodenough (Vermont Law) brought the workshop back to its stated theme, explicitly bringing justice and neuroscience together in a human imaging experiment targeted at eliciting the neural substrates underlying different kinds of decision-making – how, in particular, the neural substrates of intuitive notions of right and wrong might differ from those derived from a more formalized code of rules. Preliminary results from the imaging study suggest that discrete portions of the prefrontal cortex are engaged by the tasks designed to tap into these different modes of ethical reasoning.

Although the day's discussion ranged widely, three themes emerged repeatedly. The first was the role of conscious experience in behavior – the topic, perhaps, in which the opinions of the legal scholars and neuroscientists most consistently differed. A growing understanding of the role of conscious vs. unconscious processing in driving behavior may alter our notions of justice; such an understanding also points naturally to the second theme of the roundtable, the question of how to implement evolving notions of justice in a fair penal system.

The third theme was the relationship between scientific and legal modes of thinking. Several participants pointed out that what we do when we try to justify why we think certain things are right or wrong, has much in common with how scientists think about their data. Both are attempts at abstraction, trying to derive general principles from particular examples. Both are confounded by the abundance of natural variation. While there are both obvious advantages and costs to these modes of thinking, they may point towards a deeper point: that this function of abstraction is fundamental to the organ responsible for both science and law.