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Gray Matter in the Courtroom

Neuroscience as Legal Evidence

This fall, the U.S. Supreme Court heard arguments in *Roper v. Simmons*, a capital murder case from Missouri. In 1993, Christopher Simmons, age 17, and Charles Benjamin, age 15, abducted and murdered Shirley Ann Crook during an attempted robbery that netted them six dollars. A jury found Simmons and Benjamin guilty, and Simmons was sentenced to death. But in 2003, the Missouri Supreme Court overturned Simmons's death sentence, citing the Supreme Court's decision in *Atkins v. Virginia* (which struck down laws that allowed the execution of the mentally retarded) and a "growing consensus" against imposing the death penalty on juveniles.

The constitutional question before the Supreme Court was whether the death penalty for people ages 16 and 17 violates the Eighth Amendment prohibition on "cruel and unusual punishment." Nineteen states currently allow the juvenile death penalty, and in 1989, the Court upheld a state's right to execute people over the age of fifteen who commit capital offenses. But this penalty is rarely imposed; only three states have executed juveniles in the past ten years. Nevertheless, prosecutors in states such as Missouri have argued for the need to retain the juvenile death penalty as an option for punishing the most heinous criminals.

But the *Simmons* case has generated interest outside the legal community. The American Medical Association (AMA), the American Psychiatric Association (APA), the National Association of Social Workers, and the National Mental Health Association, among others, all filed briefs on behalf of Simmons. Why has the medical and scientific community waded into the thicket of constitutional criminal procedure? These groups are arguing that the Court should consider new research on brain function in its

assessment of the juvenile death penalty. "The adolescent's mind works differently from ours. Parents know it. This Court has said it. Legislatures have presumed it for decades or more. And now, new scientific evidence sheds light on the differences," the AMA and APA argued in their brief. "Scientists have documented the differences along several dimensions. Adolescents as a group, even at the age of 16 or 17, are more impulsive than adults. They underestimate risks and overvalue short-term benefits. They are more susceptible to stress, more emotionally volatile, and less capable of controlling their emotions than adults. In short, the average adolescent cannot be expected to act with the same control or foresight as a mature adult."

The basic argument is that because adolescent brains are not fully developed, the mechanisms of control that prevent criminal behavior are inadequate. In 2001, Elizabeth Sowell and her colleagues at UCLA published a study in *The Journal of Neuroscience* noting, "for the first time we have mapped the spatial distribution of late brain growth and demonstrate that it does indeed continue in the frontal and posterior temporal lobes during the post-adolescent years." In a 2002 interview, Dr. Jay Giedd, a neuroscientist at the National Institutes of Mental Health, explained that in the teen years, the "part of the brain that is helping organization, planning and strategizing is not done being built yet.... [It's] not that the teens are stupid or incapable of [things]. It's sort of unfair to expect them to have adult levels of organizational skills or decision making before their brain is finished being built."

Similarly, developmental neuroscientist Abigail Baird of Dartmouth used magnetic resonance imaging to scan the brains of 12- to 18-year-olds and monitor their reactions to photographs of people expressing emotion. Adults in Baird's study tended to have appropriate responses to the images, but teenagers often misunderstood the emotions being shown to them. "The finding was that the alarm system—the amygdala—was ready to go," Baird told the *New York Times* last October. "But the interpreter—the prefrontal cortex—doesn't care, and they don't seem to be able to make it care."

But as Amanda Schaffer noted in *Slate*, not all of the research is so conclusive, including some that was cited in the briefs filed before the Supreme Court. One study by Deborah Yurgelun-Todd, which is similar to Baird's work and was cited in the AMA brief, involved using MRIs to measure how adolescent and adult brains reacted to photographs of people expressing fear. She concluded that adolescents did not utilize the prefrontal cortex in processing the images. "[W]ith emotional information, the teenager's brain may be responding with more of a gut reaction than an executive or thinking kind of response. And if that's the case... you'll have more of an impulsive behavioral response," Yurgelun-Todd told PBS. But as Baird and others have pointed out, Yurgelun-Todd's study

used black and white photographs; when color photographs are used, younger research subjects have very different reactions, suggesting that sweeping conclusions about brain function and impulse control are premature.

Clearly, there is growing enthusiasm among some defense attorneys and crusading neuroscientists who think that the fruits of this new field will mitigate the sentencing of juveniles and adults alike. But there is reason for such advocates to be skeptical. For one thing, pictures of the supposedly out-of-control brain have just as much potential to frighten and thus harden juries as they do to win their sympathies and lenience. And if the science does progress, one could imagine an era of predictive justice, where punishments are handed out not based on deeds alone but on brain scans that claim to demonstrate scientifically an individual's "future dangerousness."

Many neuroscientists are wisely cautious about the judicial uses of their findings. Commenting on the *Simmons* case to National Public Radio, Dr. Giedd said, "Well, from the neural imaging perspective we can say with some certainty that the brain of a teen is different from the brain of a 25-year-old. And it's probably the case that teens as a group are more impulsive and weigh factors differently when making decisions than adults, but from the judicial perspective I think that's where the science stops and the speculation starts." Similarly, Dr. Sowell told *Science*, "The scientific data aren't ready to be used by the judicial system. The hardest thing … is to bring brain research into real-life contexts."

The AMA and other scientific opponents of the juvenile death penalty are quick to note that their research suggests nothing about moral responsibility. "Neither moral culpability, nor qualification for the death penalty is susceptible to scientific measurement," their brief notes. But questions regarding scientific evidence of culpability have already begun to make appearances in criminal proceedings. As a recent working paper from the President's Council on Bioethics notes, there are already "a few noteworthy instances in which neuroimaging evidence has been introduced at the guilt phase of the criminal process to support claims of lack of requisite culpable mental state or excuse defenses based on insanity."

Of course, the use of such imaging is not without precedent—lie detectors, for example, are primitive ways of replacing imperfect human discernments with more objective scientific tests. But neuroscience, at its most ambitious, aims to go beyond existing diagnostics—it seeks to diagnose the very soul of the brains it scans, or at least those parts of the brain that make men into murderers or molesters. We are skeptical that the science will ever gain the precision necessary to predict the unpredictable—to uncover dangerous individuals in ways that behavioral observation alone would miss. And we are skeptical that modern societies will replace a jurisprudence based on the premise of "innocent until proven

guilty" with a world of "pre-cog" neuroscientists locking up the soon-to-be guilty. But even the pretense of such knowledge, backed by sophisticated pictures and expert witnesses, may reshape our justice system in new and unpredictable ways.