Less Guilty by Reason of Adolescence

Developmental Immaturity, Diminished Responsibility, and the Juvenile Death Penalty

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The authors use a developmental perspective to examine questions about the criminal culpability of juveniles and the juvenile death penalty. Under principles of criminal law, culpability is mitigated when the actor's decision-making capacity is diminished, when the criminal act was coerced, or when the act was out of character. The authors argue that juveniles should not be held to the same standards of criminal responsibility as adults, because adolescents' decision-making capacity is diminished, they are less able to resist coercive influence, and their character is still undergoing change. The uniqueness of immaturity as a mitigating condition argues for a commitment to a legal environment under which most youths are dealt with in a separate justice system and none are eligible for capital punishment.

Since 1990, only a handful of countries in the world—Congo, Iran, Yemen, Saudi Arabia, Pakistan, Nigeria, and the United States—have executed individuals whose crimes were committed when they were juveniles (Bradley, 2002; de la Vega, 2002). Twenty-one states in the United States allow the execution of individuals under the age of 18, and in most of these states, adolescent offenders as young as 16 can be sentenced to death (Streib, 2002). The United States Supreme Court has held that the death penalty is unconstitutional for youths who are under 16 at the time of their offense (*Thompson v. Oklahoma*, 1998) but has declined to categorically prohibit capital punishment for 16- and 17-year-olds (*Stanford v. Kentucky*, 1989).

Several events have occurred recently that, considered together, suggest that it is time to reexamine the constitutionality of the juvenile death penalty. First, in *Atkins v. Virginia* (2002), the Supreme Court ruled that the execution of mentally retarded offenders violates the U.S. Constitution; some of the reasons offered by the Court for the ban may also apply to the capital punishment of juveniles. Second, following the *Atkins* decision, three Supreme Court justices took the unusual step of urging reconsideration of the constitutional status of the juvenile death penalty, suggesting considerable dissatisfaction at the highest level with current doctrine (Lane, 2002). Finally, after the apprehension of the Washington-area serial snipers, one of whom, Lee Malvo, was 17 years old, prosecutors vied for the right to try the case in their jurisdiction. It was widely speculated that Attorney General Ashcroft selected Virginia as the venue, in large part, because that jurisdiction permits the execution of juveniles, whereas Maryland, where the majority of the killings took place, does not (Lichtblau, 2002). Thus, this highly publicized case has focused national attention on the debate over the juvenile death penalty.

The juvenile death penalty is a critically important issue in juvenile crime policy, but it is not our sole focus in this article. We are interested in the broader question of whether juveniles should be punished to the same extent as adults who have committed comparable crimes. Capital punishment is the extreme case, but in practical effect, it is not the most important one in an era in which youth crime policy has become increasingly punitive. The question of whether juveniles should be punished like adults is important to discussions about sentencing guidelines, the transfer of juvenile offenders into the adult criminal justice system, and the incarceration of juveniles in adult facilities (Fagan & Zimring, 2000). High-profile murder cases, like those involving Lee Malvo or Lionel Tate, the Florida 14-year-old who was sentenced to life in prison for killing a playmate during a wrestling match, generate public attention to these matters (e.g., Browning, 2001), but questions about the appropriate punishment of juvenile offenders arise in many less visible cases, including those involving nonviolent crimes such as drug selling (Clary, 2001).

In this article, we draw on research and theory about adolescent development to examine questions about the criminal culpability of juveniles. Recent shifts in juvenile justice policy and practice toward the harsher treatment of youthful offenders are grounded in concerns about public protection and the belief that there is no good reason to exercise leniency with young offenders. This view rejects

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Work on this article was supported by the John D. and Catherine T. MacArthur Foundation Research Network on Adolescent Development and Juvenile Justice, of which the authors are members.

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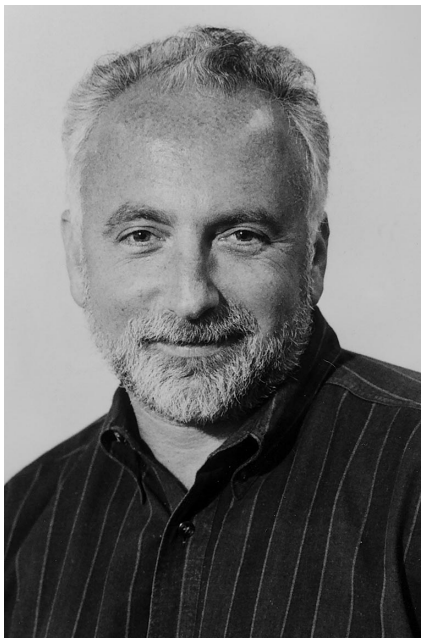
 0003-066X/03/$12.00
Vol. 58, No. 12, 1009–1018 DOI: 10.1037/0003-066X.58.12.1009



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the conventional wisdom behind traditional juvenile justice policy and challenges those who support reduced punishment for juveniles to justify a separate, more lenient justice regime for young offenders. We accept this challenge, and we argue that emerging knowledge about cognitive, psychosocial, and neurobiological development in adolescence supports the conclusion that juveniles should not be held to the same standards of criminal responsibility as adults. Under standard, well-accepted principles of criminal law, the developmental immaturity of juveniles mitigates their criminal culpability and, accordingly, should moderate the severity of their punishment.

Excuse and Mitigation in the Criminal Law

The starting point for our argument is the core principle of penal proportionality—the foundation of any legitimate system of state punishment (Bonnie, Coughlin, & Jeffries, 1997). Proportionality holds that fair criminal punishment is measured not only by the amount of harm caused or threatened by the actor but also by his or her blameworthiness. Thus, the question we address is whether, and in what ways, the immaturity of adolescent offenders is relevant to their blameworthiness and, in turn, to appropriate punishment for their criminal acts. Answering this question requires a careful examination of the developmental capacities and processes that are relevant to adolescent criminal choices, as well as the conditions and circumstances that reduce culpability in the criminal law (Scott & Steinberg, 2003).

As a preliminary matter, it is important to distinguish between excuse and mitigation, two constructs that are distinct within the law but that are often blurred in laypersons' discussions of crime and punishment (Hart, 1968). In legal parlance, *excuse* refers to the complete exculpation of a criminal defendant; he or she bears no responsibility for the crime and should receive no punishment. Not surprisingly, defenses that excuse actors altogether from criminal liability are very narrowly drawn. For example, crimes committed under extreme duress may be excused—one who acts with a gun to one's head, for instance—whereas crimes committed under less stressful conditions would not (Robinson, 1997; Wasik, 1977). Unlike excuse, which calls for a binary judgment—guilty or not guilty—*mitigation* places the culpability of a guilty actor somewhere on a continuum of criminal culpability and, by extension, a continuum of punishment. Thus, mitigation is a consideration when a harmful act is sufficiently blameworthy to meet the minimum threshold of criminal responsibility, but the actor's capacities are sufficiently compromised, or the circumstances of the crime sufficiently coercive, to warrant *less* punishment than the typical offender would receive. For example, mental illness that distorts an individual's decision making, but that is not severe enough to support an insanity defense, can reduce the grade of an offense or result in a less punitive disposition (Bonnie et al., 1997).

The public debate about the criminal punishment of juveniles is often heated and ill-informed, in part because the focus is typically on excuse when it should be on mitigation. It is often assumed, in other words, that the only alternative to adult punishment of juveniles is no punishment at all—or a slap on the hand. Instead, we argue that the developmental immaturity of adolescence mitigates culpability and justifies more lenient punishment, but that it is not, generally, a basis for excuse—except in the case of *very* young, preadolescent offenders. That is, a juvenile offender, owing to his or her developmental immaturity, should be viewed as *less* culpable than a comparable adult offender, but not as an actor who is without any responsibility for the crime. The public understandably wants to make sure that juvenile offenders are held responsible for their crimes, so that other would-be offenders receive a strong message about the costs of crime, and so that the community is protected from those who might offend again (Bennett, DiIulio, & Walters, 1996). A policy based on mitigation can achieve these goals; at the same time, however, such a policy recognizes that youths are less culpable than adults and punishes them less harshly.

Criminal law doctrine takes account of excuse and mitigation in many ways in calculating the seriousness of offenses and the amount of punishment that is appropriate. For example, defenses such as duress, insanity, and self-defense recognize that actors can cause the harm of the offense but be less culpable than the typical offender—or, in extreme cases, not culpable at all (Robinson, 1997). Also, under the law of homicide, punishment for causing the death of another varies dramatically depending on the blameworthiness of the actor (Michael & Wechsler, 1937). The actor who kills intentionally is deemed less culpable when he or she does so without premeditation and deliberation. One who kills in response to provocation or under extreme emotional disturbance is guilty only of manslaughter, not murder. And a person who causes a victim's death

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through negligence is punished less severely than one who actually intends to kill (Bonnie et al., 1997). Finally, mitigation plays a key role in sentencing. In most states, sentencing guidelines include a list of mitigating factors to be considered in the determination of the amount of punishment the convicted offender should receive. These mitigating factors include traits of the offender and circumstances surrounding the offense that may reduce culpability (Florida Annotated Statutes, 2001).

In general, factors that reduce criminal culpability can be grouped roughly into three categories. The first category includes endogenous impairments or deficiencies in the actor's decision-making capacity that affect his or her choice to engage in criminal activity. The incapacity—or diminished capacity—may be due to mental illness or mental retardation, extreme emotional distress, or susceptibility to influence or domination (Kadish, 1987).

Under the second category, culpability is reduced when the external circumstances faced by the actor are so compelling that an ordinary (or "reasonable") person might have succumbed to the pressure in the same way as did the defendant (Morse, 1994). The extraordinary circumstances could involve duress, provocation, threatened injury, or extreme need. A person who commits a crime in response to these circumstances typically receives less punishment than one who commits a comparable crime under less compelling conditions.

The third category of mitigation includes evidence that the criminal act was out of character for the actor and that, unlike the typical criminal act, his or her crime was not the product of bad character. For example, a reduced sentence might result if the crime was a first offense; if the actor expressed genuine remorse or tried to mitigate the harm; if the actor had a history of steady employment, fulfillment of family obligations, and good citizenship; or, more generally, if the criminal act was aberrant in light of the defendant's established character traits and respect for the law's values (United States Sentencing Commission, 1998).

Developmental Immaturity and Mitigation

Each of the categories of mitigation described in the previous section is important to an assessment of the culpability of adolescents who become involved in crime, and each sheds light on differences between normative adolescents and adults. First, and most obviously, adolescents' levels of cognitive and psychosocial development are likely to shape their choices, including their criminal choices, in ways that distinguish them from adults and that may undermine competent decision making. Second, because adolescents' decision-making capacities are immature and their autonomy constrained, they are more vulnerable than are adults to the influence of coercive circumstances that mitigate culpability for all persons, such as provocation, duress, or threat. Finally, because adolescents are still in the process of forming their personal identity, their criminal behavior is less likely than that of an adult to reflect bad character. Thus, for each of the sources of mitigation in criminal law, typical adolescents are less culpable than are adults because adolescent criminal conduct is driven by transitory influences that are constitutive of this developmental stage.

Deficiencies in Decision-Making Capacity

It is well established that reasoning capabilities increase through childhood into adolescence and that preadolescents and younger teens differ substantially from adults in their cognitive abilities (Keating, 1990). These basic improvements in reasoning are complemented by increases in specific and general knowledge gained through education and experience and by improvements in basic information-processing skills, including attention, short- and long-term memory, and organization (Siegler, 1997)

Although few psychologists would challenge the assertion that most adults have better reasoning skills than preadolescent children, it is often asserted that, by mid-adolescence, teens' capacities for understanding and reasoning in making decisions roughly approximate those of adults (Fischhoff, 1992; Furby & Beyth-Marom, 1992). Indeed, advocates for adolescent self-determination made this argument in support of adolescent abortion rights (American Psychological Association, 1990; Melton, 1983). However, as we and our colleagues have argued in several recent articles, there is good reason to question whether age differences in decision making disappear by mid-adolescence, particularly as capacities may be manifested in the real-world settings in which choices about criminal activity are made (Scott, Reppucci, & Woolard, 1995; Steinberg & Cauffman, 1996). Laboratory studies that are the basis of the assertion that adolescents' reasoning ability is equivalent to that of adults are only modestly

useful in understanding how youths compare with adults in making choices that have salience to their lives or that are presented in stressful, unstructured settings in which decision makers must rely on personal experience, knowledge, and intuition (Cauffman & Steinberg, 2000; Scott et al., 1995; Steinberg, 2003; Steinberg & Cauffman, 1996). In typical laboratory studies of decision making, individual adolescents are presented with hypothetical dilemmas under conditions of low emotional arousal and then asked to make and explain their decisions. In the real world, and especially in situations in which crimes are committed, however, adolescents' decisions are not hypothetical, they are generally made under conditions of emotional arousal (whether negative or positive), and they usually are made in groups. In our view, it is an open and unstudied question whether, under real-world conditions, the decision making of mid-adolescents is truly comparable with that of adults.

More important, even when teenagers' cognitive capacities come close to those of adults, adolescent judgment and their actual decisions may differ from that of adults as a result of psychosocial immaturity. Among the psychosocial factors that are most relevant to understanding differences in judgment and decision making are (a) susceptibility to peer influence, (b) attitudes toward and perception of risk, (c) future orientation, and (d) the capacity for self-management. Whereas cognitive capacities shape the *process* of decision making, psychosocial immaturity can affect decision-making *outcomes*, because these psychosocial factors influence adolescent values and preferences in ways that drive the cost–benefit calculus in the making of choices. In other words, to the extent that adolescents are less psychosocially mature than adults, they are likely to be deficient in their decision-making capacity, even if their cognitive processes are mature (Cauffman & Steinberg, 2000; Scott et al., 1995; Steinberg & Cauffman, 1996).

There is considerable evidence that the four dimensions of psychosocial maturity described in the previous paragraph continue to develop during the adolescent years. First, substantial research supports the conventional wisdom that, even in middle adolescence, teenagers are more responsive to peer influence than are adults. Studies in which adolescents are presented with hypothetical dilemmas in which they are asked to choose between an antisocial course of action suggested by their peers and a prosocial one of their own choosing indicate that susceptibility to peer influence increases between childhood and early adolescence as adolescents begin to individuate from parental control, peaks around age 14, and declines slowly during the high school years (Berndt, 1979; Steinberg & Silverberg, 1986). Peer influence affects adolescent judgment both directly and indirectly. In some contexts, adolescents make choices in response to direct peer pressure to act in certain ways. More indirectly, adolescents' desire for peer approval—and fear of rejection—affect their choices, even without direct coercion. Peers also provide models for behavior that adolescents believe will assist them in accomplishing their own ends (Moffitt, 1993).

Second, it is well established that over an extended period between childhood and young adulthood, individuals become more future-oriented. Studies in which individuals are asked to envision themselves or their circumstances in the future find that adults project out their visions over a significantly longer time frame than do adolescents (Greene, 1986; Nurmi, 1991). In addition, in studies in which individuals are queried about their perceptions of the short-term and longer term pros and cons of various sorts of risk taking (e.g., the risk of having unprotected sex, Gardner & Herman, 1990) or asked to give advice to others about risky decisions (e.g., whether to have cosmetic surgery; Halpern-Felsher & Cauffman, 2001), adolescents tend to discount the future more than adults do and to weigh more heavily short-term consequences of decisions—both risks and benefits—in making choices. There are at least two plausible explanations for this age difference in future orientation. First, owing to cognitive limitations in their ability to think in hypothetical terms, adolescents simply may be less able than adults to think about events that have not yet occurred (i.e., events that may occur sometime in the future). Second, the weaker future orientation of adolescents may reflect their more limited life experience. For adolescents, a consequence 5 years in the future may seem very remote in relation to how long they have been alive; teens may simply attach more weight to short-term consequences because they seem more salient to their lives (Gardner, 1993).

Third, adolescents differ from adults in their assessment of and attitude toward risk. In general, adolescents use a risk–reward calculus that places relatively less weight on risk, in relation to reward, than that used by adults. When asked to advise peers on making a potentially risky decision, for example (e.g., whether to participate in a study of an experimental drug), adults spontaneously mentioned more potential risks than did adolescents (Halpern-Felsher & Cauffman, 2001). In addition, experimental studies that use gambling tasks show that, compared with those of adults, adolescents' decisions are more driven by rewards and less by risks (see Furby & Beyth-Marom, 1992).

A number of explanations for this age difference have been offered. First, youths' relatively weaker risk aversion may be related to their more limited time perspective, because taking risks is less costly for those with a smaller stake in the future (Gardner & Herman, 1990). Second, adolescents may have different values and goals than do adults, leading them to calculate risks and rewards differently (Furby & Beyth-Marom, 1992). For example, the danger of some types of risk taking (e.g., driving well over the speed limit) could constitute reward for an adolescent but a cost to an adult. In addition, considerable evidence indicates that people generally make riskier decisions in groups than they do alone (Vinokur, 1971); there is evidence both that adolescents spend more time in groups than do adults and, as noted earlier, that adolescents are relatively more susceptible to the influence of others.

Fourth, although more research is needed, the widely held stereotype that adolescents are more impulsive than adults finds some support in research on developmental changes in impulsivity and self-reliance over the course of adolescence. As assessed on standardized self-report per-

sonality measures, impulsivity increases between middle adolescence and early adulthood and declines thereafter, and gains in self-management skills take place during early, middle, and late adolescence (Greenberger, 1982; Steinberg & Cauffman, 1996). Studies using the Experience Sampling Method, in which individuals are paged several times each day and asked to report on their emotions and activities, indicate that adolescents have more rapid and more extreme mood swings (both positive and negative) than adults, which may lead them to act more impulsively (Larson, Csikszentmihalyi, & Graef, 1980). Taken together, these findings indicate that adolescents may have more difficulty regulating their moods, impulses, and behaviors than do adults.

Most of the developmental research on cognitive and psychosocial functioning in adolescence measures behaviors, self-perceptions, or attitudes, but mounting evidence suggests that at least some of the differences between adults and adolescents have neuropsychological and neurobiological underpinnings. What is most interesting is that studies of brain development during adolescence, and of differences in patterns of brain activation between adolescents and adults, indicate that the most important developments during adolescence occur in regions that are implicated in processes of long-term planning, the regulation of emotion, impulse control, and the evaluation of risk and reward (Spear, 2000). For example, changes in the limbic system around puberty may stimulate adolescents to seek higher levels of novelty and to take more risks and may contribute to increased emotionality and vulnerability to stress (Dahl, 2001). At the same time, patterns of development in the prefrontal cortex, which is active during the performance of complicated tasks involving long-term planning and judgment and decision making, suggest that these higher order cognitive capacities may be immature well into late adolescence (Geidd et al., 1999; Sowell, Thompson, Holmes, Jernigan, & Toga, 1999).

At this point, the connection between neurobiological and psychological evidence of age differences in decision-making capacity is indirect and suggestive. However, the results of studies using paper-and-pencil measures of future orientation, impulsivity, and susceptibility to peer pressure point in the same direction as the neurobiological evidence, namely, that brain systems implicated in planning, judgment, impulse control, and decision making continue to mature into late adolescence. Thus, there is good reason to believe that adolescents, as compared with adults, are more susceptible to influence, less future oriented, less risk averse, and less able to manage their impulses and behavior, and that these differences likely have a neurobiological basis. The important conclusion for our purposes is that juveniles may have diminished decision-making capacity compared with adults because of differences in psychosocial capacities that are likely biological in origin.

It is easy to see how psychosocial immaturity can contribute to youthful choices to get involved in crime. Consider the following scenario (adapted from Scott & Grisso, 1997). An adolescent is hanging out with his friends, when one member of the peer group, on spur of the moment, suggests that they rob a passer-by to get money to buy beer. The adolescent does not really go through a deliberative decision-making process but "chooses" to go along, despite having mixed feelings, because he assumes that his standing in the group will suffer if he declines to participate—a negative consequence to which he attaches considerable weight. Although a more mature person might think of options to extricate himself from the situation, the adolescent may not, because he lacks experience in similar circumstances, because the choice is made so quickly, or because he has difficulty projecting the course of events into the future. On top of this, the "adventure" of the hold-up and the possibility of getting some money from it are appealing. These immediate and concrete rewards, along with the reward of peer approval, weigh more heavily in his decision than the abstract and temporally remote possibility of apprehension by the police. The last thing the adolescent considers is the long-term costs associated with conviction of a serious crime.

The available evidence supports the conclusion that, like offenders who are mentally retarded and mentally ill, adolescents are less culpable than typical adults because of diminished decision-making capacity. To some extent, jurists have acknowledged this. In *Thompson v. Oklahoma* (1998), for example, the Supreme Court pointed to the immature judgment of youth in prohibiting the execution of juveniles whose offenses occurred before their 16th birthday. Justice Stevens concluded that to impose the death penalty on youths below this age violates the principle of proportionality:

> Less culpability should attach to a crime committed by a juvenile than to a comparable crime committed by an adult. The basis of this conclusion is too obvious to require extensive explanation. Inexperience, less intelligence and less education make a teenager less able to evaluate the consequences of his or her conduct while at the same time he or she is more apt to be motivated by mere emotion or peer pressure than is an adult. The reasons that juveniles are not trusted with the privileges and responsibilities of an adult also explain why their irresponsible conduct is not as morally reprehensible as that of an adult. (*Thompson v. Oklahoma,* 1998, p. 835)

The Supreme Court decision in *Thompson* does not speak explicitly in the language of adolescent development or support its arguments with scientific research on adolescents' capacities. Nonetheless, the Court's pronouncement can best be understood as a recognition that psychosocial immaturity compromises adolescents' decision making in ways that mitigate criminal blameworthiness.

The Court's recent rejection in *Atkins v. Virginia* (2002) of imposing the death penalty on mentally retarded offenders points more explicitly to the mitigating character of attributes that characterize adolescent decision making as well as those of retarded persons:

> Because of their impairments, . . . [mentally retarded offenders] have diminished capacities to understand and process information, to communicate, to abstract from mistakes and learn from experience, to engage in logical reasoning, to control impulses, and to understand the reactions of others. There is . . . abundant

evidence that they often act on impulse rather than pursuant to a premeditated plan, and that in group settings, they are followers rather than leaders. Their deficiencies do not warrant an exemption from criminal sanctions, but diminish their personal culpability. (*Atkins v. Virginia*, 2002, p. 2250)

Many factors that influence youthful decision making and distinguish adolescents from typical adults are similar to those that compromise the criminal choices of actors who are mentally retarded. Moreover, like offenders who are mentally retarded, there is good reason to believe that the deficiencies of adolescent judgment are organic in nature—although, among adolescents, poor judgment is shaped by transitory developmental factors and, unlike mentally retarded persons, most adolescents will mature out of their tendency to make unwise choices that are driven by the psychosocial influences. Nonetheless, during adolescence, immature judgment is likely no more subject to the volitional control of the youth than is the poor judgment of adults who are mentally retarded.

Heightened Vulnerability to Coercive Circumstances

The psychosocial immaturity of adolescents contributes to their diminished capacity (the first category of mitigation), but it is important to another source of mitigation as well. As we noted earlier, criminal culpability can be reduced on the basis of circumstances that impose extraordinary pressures on the actor. The criminal law does not require exceptional fortitude or bravery of citizens and, in general, recognizes mitigation where an ordinary (or in legal parlance, "reasonable") person might have responded in the same way as the defendant under similar circumstances. In evaluating the behavior of an adolescent in responding to extenuating circumstances, however, the correct basis for evaluation is not comparison of the actor's behavior with that of an "ordinary" adult but rather with that of an "ordinary" adolescent (*In re William G.*, 1987; Scott & Steinberg, 2003).

Because of their developmental immaturity, normative (i.e., "ordinary") adolescents may respond adversely to external pressures that adults are able to resist. If adolescents are more susceptible to *hypothetical* peer pressure than are adults (as noted earlier), it stands to reason that age differences in susceptibility to *real* peer pressure will be even more considerable. Thus, it seems reasonable to hypothesize that a youth would succumb more readily to peer influence than would an adult in the same situation. Similarly, if adolescents are more impulsive than adults, it may take less of a threat to provoke an aggressive response from a juvenile. And, because adolescents are less likely than adults to think through the future consequences of their actions, the same level of duress may have a more disruptive impact on juveniles' decision making than on that of adults. In general, legal judgments about mitigation should consider the extent to which developmentally normal adolescents are more susceptible to external pressures than are adults. Adolescents' claim to mitigation on this ground is particularly compelling in that, as legal minors, they lack the freedom that adults have to extricate themselves from a criminogenic setting (Fagan, 2000).

Although plausible inferences can be drawn about how developmental influences may affect adolescents' responses to external pressures, we do not have sufficient research comparing the behavior of adolescents and adults at varying levels of duress, provocation, or coercion. Some social psychological research has examined contextual influences on decision making—for example, the literature on the *risky shift*, which shows that individuals take more risks in groups than when alone (Vinokur, 1971)—but this research has not examined whether the impact of different contextual factors varies as a function of the decision maker's age. Further, as we noted earlier, studies comparing the decision making of adolescents with that of adults have intentionally minimized the influence of contextual factors that could affect the decision-making process differently for individuals of different ages. Recent evidence on age differences in the processing of emotionally arousing information supports the hypothesis that adolescents may tend to respond to threats more viscerally and emotionally than adults (Baird, Gruber, & Fein, 1999), but far more research on this topic is needed.

Unformed Character as Mitigation

In addition to the mitigating effects of adolescents' diminished decision-making capacity and greater vulnerability to external pressures, youthful culpability is also mitigated by the relatively unformed nature of their characters. As we have noted, the criminal law implicitly assumes that harmful conduct reflects the actor's bad character and treats evidence that this assumption is inaccurate as mitigating of culpability (Duff, 1993; Vuoso, 1986). For most adolescents, the assumption *is* inaccurate, and thus their crimes are less culpable than those of typical criminals.

The emergence of personal identity is an important developmental task of adolescence and one in which the aspects of psychosocial development discussed earlier play a key role. As documented in many empirical tests of Erikson's (1968) theory of the adolescent *identity crisis*, the process of identity formation includes considerable exploration and experimentation over the course of adolescence (Steinberg, 2002a). Although the identity crisis may occur in middle adolescence, the resolution of this crisis, with the coherent integration of the various retained elements of identity into a developed *self*, does not occur until late adolescence or early adulthood (Waterman, 1982). Often this experimentation involves risky, illegal, or dangerous activities like alcohol use, drug use, unsafe sex, and antisocial behavior. For most teens, these behaviors are fleeting; they cease with maturity as individual identity becomes settled. Only a relatively small proportion of adolescents who experiment in risky or illegal activities develop entrenched patterns of problem behavior that persist into adulthood (Farrington, 1986; Moffitt, 1993). Thus, making predictions about the development of relatively more permanent and enduring traits on the basis of patterns of risky behavior observed in adolescence is an uncertain business. At least until late adolescence, individuals' val-

ues, attitudes, beliefs, and plans are likely to be tentative and exploratory expressions rather than enduring representations of personhood. Thus, research on identity development in adolescence supports the view that much youth crime stems from normative experimentation with risky behavior and not from deep-seated moral deficiency reflective of "bad" character. One reason the typical delinquent youth does not grow up to be an adult criminal is that the developmentally linked values and preferences that drive his or her criminal choices as a teenager change in predictable ways as the youth matures.

The distinction between youthful criminal behavior that is attributable to characteristics that adolescents outgrow and conduct that is attributable to relatively more permanent elements of personality is captured in Moffitt's (1993) work on the developmental trajectories of antisocial behavior. In her view, adolescent offenders fall into one of two broad categories: adolescence-limited offenders, whose antisocial behavior begins and ends during adolescence, and a much smaller group of life-course-persistent offenders, whose antisocial behavior begins in childhood and continues through adolescence and into adulthood. According to Moffitt, the criminal activity of both groups during adolescence is similar, but the underlying causes of their behavior are very different. Life-course-persistent offenders show longstanding patterns of antisocial behavior that appear to be rooted, at least in part, in relatively stable psychological attributes that are present early in development and that are attributable to deficient socialization or neurobiological anomalies. Adolescence-limited offending, in contrast, is the product of forces that are inherent features of adolescence as a developmental period, including peer pressure, experimentation with risk, and demonstrations of bravado aimed at enhancing one's status in the social hierarchy of the peer group. By definition, the causes of adolescence-limited offending weaken as individuals mature into adulthood.

In view of what we know about identity development, it seems likely that the criminal conduct of most young wrongdoers is quite different from that of typical adult criminals. Most adults who engage in criminal conduct act on subjectively defined preferences and values, and their choices can fairly be charged to deficient moral character. This cannot be said of typical juvenile actors, whose behaviors are more likely to be shaped by developmental forces that are constitutive of adolescence. To be sure, some adolescents may be in the early stages of developing a criminal identity and reprehensible moral character traits, but most are not. Indeed, studies of criminal careers indicate that the vast majority of adolescents who engage in criminal or delinquent behavior desist from crime as they mature into adulthood (Farrington, 1986). Thus the criminal choices of typical young offenders differ from those of adults not only because the choice, *qua* choice, is deficient as the product of immature judgment, but also because the adolescent's criminal act does not express the actor's bad character.

The notion that individuals are less blameworthy when their crimes are out of character is significant in assessing the culpability of typical young offenders. In one sense, young wrongdoers are not like adults whose acts are less culpable on this ground. A claim that an adult's criminal act was out of character requires a demonstration that his or her established character is good. The criminal choice of the typical adolescent cannot be evaluated in this manner because the adolescent's personal identity is in flux and his or her character has not yet stabilized. However, like the adult offender whose crime is mitigated because it is out of character, adolescent offenders lack an important component of culpability—the connection between a bad act and a bad character.

The fact that antisocial activity in adolescence is not usually indicative of bad character also raises important questions about the construct validity of *juvenile psychopathy*, a "diagnosis" that has recently received considerable attention (Edens, Skeem, Cruise, & Cauffman, 2001; Forth & Burke, 1998; Seagrave & Grisso, 2002; Steinberg, 2002b). Labeling an individual as a *psychopath*—perhaps the quintessential case of "bad character"—implies that the individual's antisocial behavior is due to fixed aspects of his or her personality. But, as we have suggested, this assumption is difficult to defend as applied to individuals whose identity development is still under way. (Indeed, it is for this very reason that the diagnosis of antisocial personality disorder is not made prior to the age of 18; American Psychiatric Association, 1994). Although the notion that some juvenile offenders are actual or "fledgling" psychopaths has become increasingly popular in legal and psychological circles, no data exist on the stability or continuity of psychopathy between adolescence and adulthood. In the absence of evidence that juveniles who, on the surface, resemble adult psychopaths (e.g., juveniles who are callous, manipulative, and antisocial) actually become adult psychopaths, it would seem unwise to use this label when describing an adolescent.

Our analysis also clarifies why the crime of the adult actor with "adolescent" traits warrants a different response than does that of the typical young offender. Although most impulsive young risk takers who focus on immediate consequences will mature into adults with different values, some adult criminals have traits that are similar to their younger counterparts. In the case of the adult, however, the predispositions, values, and preferences that motivate him or her most likely are characterological and are unlikely to change predictably with the passage of time. Adolescent traits that contribute to criminal conduct are normative in adolescence, but they are not typical of adulthood. In an adult, these traits are often part of the personal identity of an individual who is not respectful of the values of the criminal law and who deserves full punishment when he or she violates its prohibitions.

Developmental Immaturity, Diminished Culpability, and the Juvenile Crime Policy

The adolescent who commits a crime typically is not so deficient in his or her decision-making capacity that the

adolescent cannot understand the immediate harmful consequences of his or her choice or its wrongfulness, as might be true of a mentally disordered person or a child. Yet, in ways that we have described, the developmental factors that drive adolescent decision making may predictably contribute to choices reflective of immature judgment and unformed character. Thus, youthful criminal choices may share much in common with those of adults whose criminal behavior is treated as less blameworthy than that of the typical offender, because their criminal behavior is out of character, their decision-making capacities are impaired by emotional disturbance, mental illness, or retardation, or their criminal choices were influenced by unusually coercive circumstances.

If, in fact, adolescent offenders are generally less culpable than their adult counterparts, how should the legal system recognize their diminished responsibility? An important policy choice is whether immaturity should be considered on an individualized basis, as is typical of most mitigating conditions, or as the basis for treating young law violators as a separate category of offenders (Scott & Steinberg, 2003).

We believe that the uniqueness of immaturity as a mitigating condition argues for the adoption of, or renewed commitment to, a categorical approach, under which most youths are dealt with in a separate justice system, in which rehabilitation is a central aim, and none are eligible for the ultimate punishment of death. Other mitigators—emotional disturbance and coercive external circumstances, for example—affect criminal choices with endless variety and have idiosyncratic effects on behavior; thus, individualized consideration of mitigation is appropriate where these phenomena are involved. In contrast, the capacities and processes associated with adolescence are characteristic of individuals in a relatively defined group, whose development follows a roughly systematic course to maturity, and whose criminal choices are affected in predictable ways. Although individual variations exist within the age cohort of adolescence, of course, coherent boundaries can delineate a minimum age for adult adjudication, as well as a period of years beyond this when a strong presumption of reduced culpability operates to keep most youths in a separate system. The age boundary is justified if the presumption of immaturity can be applied confidently to most individuals in the group, as we believe is the case for juveniles. Moreover, a categorical approach to the separation of juveniles and adults offers substantial practical efficiencies over one in which immaturity must be assessed on a case-by-case basis.

A developmentally informed boundary restricting the dispositions that can be imposed on juveniles who have entered the criminal justice system represents a precommitment to taking into account the mitigating character of youth in assigning blame. Without such a commitment, immaturity often may be ignored when the exigencies of a particular case engender a punitive response, as in the case of the accused sniper Lee Malvo. Indeed, absent such a commitment, immaturity is likely to count as mitigating only when the juvenile otherwise presents a sympathetic case or when other, irrelevant factors, such as a childlike physical appearance, lead others to view the offender as relatively less blameworthy. This is a critical concern, given the evidence that racial and ethnic biases influence attitudes about the punishment of young offenders and that decision makers are more likely to discount the mitigating impact of immaturity when judging the behavior of minority youths (Bridges & Steen, 1998; Graham, 2002). A structural boundary that hinders adult adjudication of young offenders and that prohibits the use of the death penalty altogether for juveniles is justified as a counterweight to this pernicious influence.

Maintaining a categorical distinction between juvenile and adult offenders does not mean that all youths are less mature than adults in their decision-making capacity or that all juveniles are unformed in their identity development. Some individuals exhibit mature judgment at an early age (most are not offenders, however), and among others, antisocial tendencies that begin in childhood continue in a stable pattern of criminal conduct that defines their adult character. Adult punishment of psychologically mature youths might be fair if these individuals could be identified with some degree of certainty. But we currently lack the diagnostic tools to evaluate psychosocial immaturity reliably on an individualized basis or to distinguish young career criminals from ordinary adolescents who will repudiate their reckless experimentation as adults. As a consequence, litigating maturity on a case-by-case basis is likely to be an error-prone undertaking. This risk of error is problematic as a general matter, but it is unacceptable when the stakes are life and death. In our view, this risk of error argues against ever imposing the death penalty on young offenders.

A policy that treats immaturity as a mitigating condition is viable only to the extent that public protection is not seriously compromised, and public safety concerns dictate that the small group of young recidivists who inflict large amounts of social harm must be incapacitated as adults. That is not to say that we should "throw away the key" when we incapacitate these youths, however. Given the uncertainty of predicting adult character during adolescence, efforts should be made to protect against the iatrogenic effects of incarceration in prison and to invest in the future postincarceration lives of even serious chronic offenders (Scott & Grisso, 1997).

Ongoing research on the links between brain maturation and psychological development in adolescence has begun to shed light on why adolescents are not as planful, thoughtful, or self-controlled as adults, and, more importantly, it clarifies that these "deficiencies" may be physiological as well as psychological in nature. Nevertheless, we are a long way from comprehensive scientific understanding in this area, and research findings are unlikely to ever be sufficiently precise to draw a chronological age boundary between those who have adult decision-making capacity and those who do not. Some of the relevant abilities (e.g., logical reasoning) may reach adultlike levels in middle adolescence, whereas others (e.g., the ability to resist peer influence or think through the future consequences of

one's actions) may not become fully mature until young adulthood.

Many perspectives can inform debates about youth crime policy and the juvenile death penalty, but surely one should be the science of developmental psychology. Psychologists have much to contribute to discussions about the underpinnings, biological bases, and developmental course of the capacities and competencies relevant to criminal culpability and to the appropriateness of capital punishment for juveniles. Especially needed are studies that link developmental changes in decision making to changes in brain structure and function, and studies that examine age differences in decision making under more ecologically valid conditions.

In our view, however, there is sufficient indirect and suggestive evidence of age differences in capacities that are relevant to criminal blameworthiness to support the position that youths who commit crimes should be punished more leniently than their adult counterparts. Although, as we have noted, the definitive developmental research has not yet been conducted, until we have better and more conclusive data, it would be prudent to err on the side of caution, especially when life and death decisions are concerned. The Supreme Court has repeatedly emphasized that the death penalty is acceptable punishment only for the most blameworthy killers (*Gregg v. Georgia*, 1976; *Lockett v. Ohio*, 1978). All other developed countries have adopted a policy that assumes that adolescents, because of developmental immaturity, simply do not satisfy this criterion. The United States should join the majority of countries around the world in prohibiting the execution of individuals for crimes committed under the age of 18.

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January 2004

Cruel and Unusual Punishment: The Juvenile Death Penalty

Adolescence, Brain Development and Legal Culpability

"[They] frequently know the difference between right and wrong and are competent to stand trial. Because of their impairments, however, by definition they have diminished capacities to understand and process mistakes and learn from experience, to engage in logical reasoning, to control impulses, and to understand the reactions of others…. Their deficiencies do not warrant an exemption from criminal sanctions, but they do diminish their personal culpability."

Atkins v. Virginia, *536 U.S. 304, 318, 122 S.Ct. 2242, 2250 (2002)*

In 2002, the U.S. Supreme Court banned the execution of mentally retarded persons. This decision, *Atkins v. Virginia*, cited the underdeveloped mental capacities of those with mental retardation as a major factor behind the Justices' decision.

Adolescence is a transitional period during which a child is becoming, but is not yet, an adult. An adolescent is at a crossroads of changes where emotions, hormones, judgment, identity and the physical body are so in flux that parents and even experts struggle to fully understand.

As a society, we recognize the limitations of adolescents and, therefore, restrict their privileges to vote, serve on a jury, consume alcohol, marry, enter into contracts, and even watch movies with mature content. Each year, the United States spends billions of dollars to promote drug use prevention and sex education to protect youth at this vulnerable stage of life. When it comes to the death penalty, however, we treat them as fully functioning adults.

The Basics of the Human Brain

The human brain has been called the most complex three-pound mass in the known universe. This is a well deserved reputation, for this organ contains billions of connections among its parts and governs countless actions, involuntary and voluntary, physical, mental and emotional.

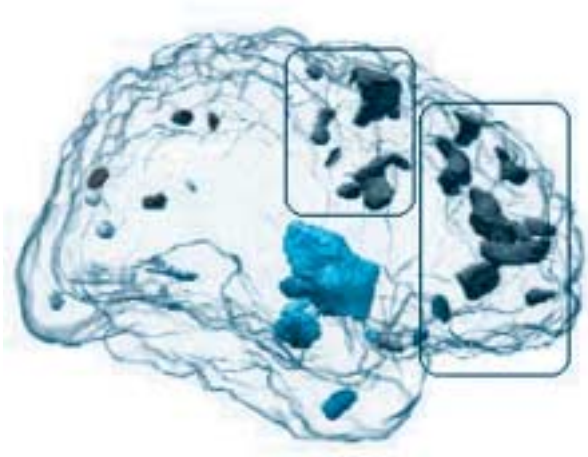
The largest part of the brain is the *frontal lobe*. A small area of the frontal lobe located behind the forehead, called the *prefrontal cortex*, controls the brain's most advanced functions. This part, often referred to as the "CEO" of the body, provides humans with advanced cognition. It allows us to prioritize thoughts, imagine, think in the abstract, anticipate consequences, plan, and control impulses.

Along with everything else in the body, the brain changes significantly during adolescence. In the last five years, scientists, using new technologies, have discovered that adolescent brains are far less developed than previously believed.

New Technology, New Discoveries

Scientists are now utilizing advances in magnetic resonance imaging (MRI) to create and study three-dimensional images of the brain without the use of radiation (as in an x-ray). This breakthrough allows scientists to safely scan children over many years, tracking the development of their brains.[1]

Researchers at Harvard Medical School, the National Institute of Mental Health, UCLA, and others, are collaborating to "map" the development of the brain from childhood to adulthood and examine its implications.



A three dimensional "map" showing portions of gray matter "pruned" from the brain between adolescence and adulthood. The dark portions in the two boxes indicate sections that will be discarded from the **frontal lobe**. The box on the far right indicates the **prefrontal cortex**, a subsection of the frontal lobe that controls judgment.

Image adapted from *Nature Neuroscience*.

The scientists, to their surprise, discovered that the teenage brain undergoes an intense overproduction of *gray matter* (the brain tissue that does the "thinking"). Then a period of "pruning" takes over, during which the brain discards gray matter at a rapid rate.[2] This process is similar to pruning a tree: cutting back branches stimulates health and growth.

In the brain, pruning is accompanied by *myelination*, a process in which *white matter* develops. White matter is fatty tissue that serves as insulation for the brain's circuitry, making the brain's operation more precise and efficient.[3]

Researchers have carefully scrutinized the pace and severity of these changes and have learned that they continue into a person's early 20s. Dr. Elizabeth Sowell, a member of the UCLA brain research team, has led studies of brain development from adolescence to adulthood. She and her colleagues found that the frontal lobe undergoes far more change during adolescence than at any other stage of life.[4] It is also the last part of the brain to develop, which means that even as they become fully capable in other areas, adolescents cannot reason as well as adults: "[m]aturation, particularly in the frontal lobes, has been shown to correlate with measures of cognitive functioning."[5]

Biology and Behavior

Jay Giedd, a researcher at the National Institute of Mental Health, explains that during adolescence the "part of the brain that is helping organization, planning and strategizing is not done being built yet…. It's sort of unfair to expect [adolescents] to have adult levels of organizational skills or decision making before their brain is finished being built."[6]

Dr. Deborah Yurgelun-Todd of Harvard Medical School has studied the relation between these new findings and teen behavior and concluded that adolescents often rely on emotional parts of the brain, rather than the frontal lobe. She explains, "one of the things that teenagers seem to do is to respond more strongly with gut response than they do with evaluating the consequences of what they're doing."[7]

Also, appearances may be deceiving: "Just because they're physically mature, they may not appreciate the consequences or weigh information the same way as adults do. So we may be mistaken if we think that [although] somebody looks physically mature, their brain may in fact not be mature."[8]

This discovery gives us a new understanding into juvenile delinquency. The frontal lobe is "involved in behavioral facets germane to many aspects of criminal culpability,"[9] explains Dr. Ruben C. Gur, neuropsychologist and Director of the Brain Behavior Laboratory at the University of Pennsylvania. "Perhaps most relevant is the involvement of these brain regions in the control of aggression and other impulses…. If the neural substrates of these behaviors have not reached maturity before adulthood, it is unreasonable to expect the behaviors themselves to reflect mature thought processes.

"The evidence now is strong that the brain does not cease to mature until the early 20s in those relevant parts that govern impulsivity, judgment, planning for the future, foresight of consequences, and other characteristics that make people morally culpable…. Indeed, age 21 or 22 would be closer to the 'biological' age of maturity."[10]

Other Changes in the Body

In addition to the profound physical changes of the brain, adolescents also undergo dramatic hormonal and emotional changes. One of the hormones which has the most dramatic effect on the body is testosterone. Testosterone, which is closely associated with aggression, increases tenfold in adolescent boys.[11]

> **"Just because they're physically mature, they may not appreciate the consequences or weigh information the same way as adults do. So, [although] somebody looks physically mature, their brain may in fact not be mature."**
>
> Deborah Yurgelun-Todd, PhD
> Brain Imaging Laboratory,
> McClean Hospital
> Harvard University Medical School

Emotionally, an adolescent "is really both part child and part adult,"[12] explains Melvin Lewis, an expert in child psychiatry and pediatrics at Yale University School of Medicine. Normal development at this time includes self-searching, during which the adolescent tries to grow out of his or her childlike self. This change is complicated by the conflict between an adolescent's new sense of adult identity and remaining juvenile insecurities.

The behaviors associated with this process include self-absorption, a need for privacy, mood swings, unique dress, and escapism, such as video games, music, and talking on the phone, as well as riskier behaviors, such as drug use or sexual activity.[13]

Childhood Abuse and Violence

In addition to this context of change and volatility, research shows that abusive childhood experiences can trigger violent behavior. The American Academy of Pediatrics has identified several risk factors that can spark violence in adolescents, including being witness to domestic violence or substance abuse within the family, being poorly or inappropriately supervised, and being the victim of physical or sexual assault.[14]

Researcher Phyllis L. Crocker of Cleveland-Marshall College of Law has written that "the nexus between poverty, childhood abuse and neglect, social and emotional dysfunction, alcohol and drug abuse and crime is so tight in the lives of many capital defendants as to form a kind of social historical profile."[15]

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>
> Ruben Gur, MD, PhD
> Director, University of
> Pennsylvania Medical Center

Dr. Chris Mallett, Public Policy Director at Bellefaire Jewish Children's Bureau in Ohio, recently completed the most comprehensive study of traumatic experiences in the lives of death row juvenile offenders to date.[16] He found that:

- 74% experienced family dysfunction[17]
- 60% were victims of abuse and/or neglect[18]
- 43% had a diagnosed psychiatric disorder[19]
- 38% suffered from substance addictions[20]
- 38% lived in poverty[21]

More than 30% of death row juvenile offenders had experienced six or more distinct areas of childhood trauma with an overall average of four such experiences per offender. Most children and adolescents do not face even one of these defined areas of difficulty.[22] Mallett also found that such mitigating evidence was presented to juries in fewer than half of the offenders' trials.[23]

Mallett's research confirmed findings in previous studies. In 1992, researchers found that two-thirds of all juveniles sentenced to death had backgrounds of abuse, psychological disorders, low IQ, indigence, and/or substance abuse.[24]

Dr. Jay Giedd of the National Institute of Mental Health. Image courtesy of PBS Frontline report *Inside the Teenage Brain*.

In 1987, an investigation into 14 juveniles on death row[25] (40% of the total at the time) revealed that nine had major neuropsychological disorders[26] and seven had psychotic disorders since early childhood.[27] All but two had IQ scores under 90.[28] Only three had average reading abilities, and another three had learned to read only after arriving on death row.[29] Twelve reported having been physically or sexually abused, including five who were sodomized by relatives.[30]

Delinquency Link

The turmoil often associated with adolescence can result in poor decisions and desperate behaviors. For example, studies have found that 20 to 30% of high school students consider suicide. Suicide is the third-leading cause of death among teenagers, occurring once every two hours, or over 4,000 times a year, according to the U.S. Surgeon General.[31] Approximately 30% of youths reported using an illicit drug at least once during their lifetime, and 22.2% reported using an illicit drug within the past year.[32]

Conclusion

New discoveries provide scientific confirmation that the teen years are a time of significant transition. They shed light on the mysteries of adolescence and demonstrate that adolescents have significant neurological deficiencies that result in stark limitations of judgment. Research suggests that when compounded with risk factors (neglect, abuse, poverty, etc.), these limitations can set the psychological stage for violence.

These discoveries support the assertion that adolescents are less morally culpable for their actions than competent adults and are more capable of change and rehabilitation. The ultimate punishment for minors is contrary to the idea of fairness in our justice system, which accords the greatest punishments to the most blameworthy.

This fresh understanding of adolescence does not excuse juvenile offenders from punishment for violent crime, but it clearly lessens their culpability. This concept is not new; it is why we refer to those under 18 as "minors" and "juveniles"—because, in so many respects, they are *less than adult*.

Notes

[1] For an excellent overview, see Elkhonon Goldberg, *The Executive Brain: Frontal Lobes and the Civilized Mind,* Oxford University Press (2001).

[2] Sowell, Elizabeth R, Paul M. Thompson, Colin J. Holems, Terry L. Jernigan and Arthur W. Toga. *In vivo evidence for post-adolescent brain maturation in frontal and striatal regions.* 2 Nature Neuroscience 10 (1999), also Paus, Tomas, Jay Giedd, et. al. *Structural maturation of neural pathways in children and adolescents: in vivo study.* Science, 283 (1999).

[3] Id.

[4] Id.

[5] Sowell, Elizabeth R, Paul M. Thompson, Kevin D. Tessner and Arthur W. Toga. *Mapping continued brain growth and gray matter density reduction in dorsal frontal cortex: inverse relationships during postadolescent brain maturation,* 21 Journal of Neuroscience 22 (2001), at 8819, also Reiss, A.L., et. al., *Brain development, gender and IQ in children, a volumetric imaging study.* Brain, 119 (1996).

[6] PBS Frontline, *Inside the Teen Brain*. See *Interview with Jay Giedd*, online at www.pbs.org/wgbh/pages/frontline/shows/teenbrain/.

[7] Id, at *Interview with Deborah Yurgelun-Todd*.

[8] Id.

[9] Gur, Ruben C. Declaration of Ruben C. Gur., PhD, *Patterson v. Texas.* Petition for Writ of Certiorari to US Supreme Court, J. Gary Hart, Counsel. (Online at: www.abanet.org/crimjust/juvjus/patterson.html)

[10] Id.

[11] See Adams, Gerald R., Raymond Montemayor, and Thomas P. Gullota, eds. *Psychosocial Development during Adolescence.* Thousand Oaks, CA, Sage Publications (1996).

[12] Lewis, Melvin. *Child and Adolescent Psychiatry: A comprehensive textbook,* Lippincott Williams and Wilkins (2002).

[13] See id, and Cobb, Nancy J. *Adolescence: Continuity, Change and Diversity.* Mayfield Publishing, CA (1998).

[14] American Society of Pediatrics, *Policy Statement,* 1 Pediatrics, 103 (1999).

[15] Phyllis L. Crocker. *Childhood Abuse and Adult Murder: Implications for the Death Penalty,* 77 NC L. Rev. 1143 (1999).

[16] Mallett, Chris. *Socio-Historical Analysis of Juvenile Offenders on Death Row,* 3 Juv. Corr. Mental Health Report 65 (2003).

[17] Id., at 77.

[18] Id., at 78.

[19] Id., at 77.

[20] Id., at 78.

[21] Id.

[22] Id.

[23] Id.

[24] Robinson, DA and Stephens, OH; *Patterns of mitigating factors in juvenile death penalty cases,* 3 Criminal Law Bulletin 28 (1992).

[25] Lewis, DO, Pincus, Bard, Richardson, Prichep, Feldman, Yeager. *Neuropsychiatric, psychoeducational, and family characteristics of 14 juveniles condemned to death in the United States,* 5 Am. J. of Psychiatry 145 (1988).

[26] Id.

[27] Id.

[28] Id.

[29] Id.

[30] Id.

[31] Office of the U.S. Surgeon General, *At a Glance, Suicide Among the Young:* Online at www.surgeongeneral.gov/library/calltoaction/fact3.htm

[32] White House Office of National Drug Control Policy, Juveniles and Drugs, at www.whitehousedrugpolicy.gov/drugfact/juveniles/index.html

This publication was supported in part by a grant from the Soros Justice Fellowship of the Open Society Institute. By Adam Ortiz.

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Adolescent Development and Juvenile Justice

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Annu. Rev. Clin. Psychol. 2009. 5:459–85

The *Annual Review of Clinical Psychology* is online at clinpsy.annualreviews.org

This article's doi: 10.1146/annurev.clinpsy.032408.153603

1548-5943/09/0427-0459$20.00

Key Words

adolescence, crime, neuroscience, law, policy

Abstract

Although justice system policy and practice cannot, and should not, be dictated solely by studies of adolescent development, the ways in which we respond to juvenile offending should be informed by the lessons of developmental science. This review begins with a brief overview of the history, rationale, and workings of the American juvenile justice system. Following this, I summarize findings from studies of brain, cognitive, and psychosocial development in adolescence that have implications for the treatment of juveniles in the justice system. The utility of developmental science in this context is illustrated by the application of these research findings to three fundamental issues in contemporary justice policy: the criminal culpability of adolescents, adolescents' competence to stand trial, and the impact of punitive sanctions on adolescents' development and behavior. Taken together, the lessons of developmental science offer strong support for the maintenance of a separate juvenile justice system in which adolescents are judged, tried, and sanctioned in developmentally appropriate ways.

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INTRODUCTION

Few issues challenge a society's ideas about both the nature of human development and the nature of justice as much as serious juvenile crime. Because we neither expect children to be criminals nor expect crimes to be committed by children, the unexpected intersection between childhood and criminality creates a dilemma that most people find difficult to resolve. Indeed, the only ways out of this problem are either to redefine the offense as something less serious than a crime or to redefine the offender as someone who is not really a child (Zimring 1998).

For most of the twentieth century, American society has most often chosen the first approach—redefining the offense—and has treated most juvenile infractions as matters to be adjudicated as delinquent acts within a separate juvenile justice system designed, at least in theory, to recognize the special needs and immature status of young people and to therefore emphasize rehabilitation over punishment. Indeed, for much of the past century, states believed that the juvenile justice system was a vehicle to protect the public by providing a system that responds to children who are maturing into adulthood. States recognized that conduct alone—that is, the alleged criminal act—should not be dispositive in deciding when to invoke the heavy hand of the adult criminal justice system. They recognized that by providing for accountability, treatment, and supervision in the juvenile justice system—and in the community whenever possible—they promoted short-term and long-term public safety.

During the last two decades of the twentieth century, there was a dramatic shift in the way juvenile crime was viewed by policy makers and the public. Rather than choosing to define offenses committed by youth as delinquent, society increasingly opted to deal with young offenders more punitively in the juvenile justice system or to redefine them as adults and try them in adult criminal court. This trend was reflected in the growing number of juvenile offenses adjudicated in adult criminal court, where adolescents are exposed to a far more adversarial proceeding than in juvenile court; in the increasingly punitive response of the criminal justice system to juvenile offenders who are found guilty; and in what some observers have referred to as the "criminalization" of the juvenile justice system itself through increased use of punishment, rather than rehabilitation, as a legitimate juvenile justice goal (Feld 1993).

This transformation of juvenile justice policy and practice raises difficult, but important, questions for psychologists interested in the development and well-being of young people.

These questions are variations of the more general question of whether adolescents are fundamentally different from adults in ways that warrant the differential treatment of juveniles who break the law. In particular:

- Do adolescents have the psychological capabilities necessary to function as competent defendants in adult court?
- Should juveniles accused of crimes be held to the same standards of blameworthiness as adults and punished in the same ways as adult criminals who have committed similar crimes?
- How does exposing juveniles to especially punitive sanctions affect their behavior, development, and mental health?

These questions provide this review's focus. More broadly, the purpose of this review is to integrate developmental psychological considerations into moral, legal, political, and practical analyses of juvenile crime. Because addressing this issue necessitates at least a rudimentary understanding of the rationale and workings of the juvenile justice system, I begin not with a discussion of the science of adolescent development, but rather with a short history of juvenile justice in America and a brief overview of the process through which individuals are adjudicated within the system.

Following this brief introduction to American juvenile justice, I then summarize findings from recent studies of adolescent development that bear on whether adolescents differ from adults in ways that have implications for justice system policy and practice. Because not all aspects of adolescent development are pertinent to how young people are, or should be, treated in the justice system, I limit my discussion to studies that are especially relevant to these issues. Readers interested in a broader and more comprehensive treatment of adolescent development are encouraged to consult several recent reviews of this literature (Collins & Steinberg 2006, Smetana et al. 2006) as well as a recently updated handbook on adolescent psychology (Lerner & Steinberg 2009). I then look specifically at what we know about adolescents' competence to stand trial, criminal culpability, and response to various types of sanctions and interventions.

Competence to stand trial: the ability of a defendant to understand the court proceeding, reason with relevant facts, and assist counsel

Criminal culpability: the extent to which an individual is judged to be responsible for a crime

JUVENILE JUSTICE IN AMERICA: AN OVERVIEW

The Origins of the Juvenile Justice System

Economic recessions in the early nineteenth century pushed children out of work in America's new factory system during the industrial revolution. Concerns about poor children on the street led to the creation of institutional care for children. In New York City, the Society for Prevention of Pauperism in 1824 became the Society for the Reformation of Juvenile Delinquents, and in 1825 opened the nation's first House of Refuge. Boston followed a year later and Philadelphia in 1828. These Houses of Refuge were designed to maintain class status and prevent unrest (Krisberg & Austin 1993, Platt 1977).

In 1899, Jane Addams and her Hull House colleagues established what is generally accepted as the nation's first juvenile court. Juvenile court judges, in the early part of the twentieth century, were authorized to investigate the character and social background of both predelinquent and delinquent children. They examined personal motivation as well as criminal intent, seeking to identify the moral reputation of problematic children (Platt 1977). Ben Lindsey, of Denver, was the juvenile court judge whose practice most closely matched the rhetoric of the emerging juvenile court:

> We should make it our business to study and know each particular case, because it will generally demand treatment in some little respect different from any other case.... (a) Is the child simply mischievous or criminal in its tendencies? (b) Is the case simply an exceptional or isolated instance in which a really good boy or girl has gone wrong for the first time because too weak to resist a strong temptation? (c) Is the child a victim of incompetent

Transfer: one mechanism through which juveniles' cases are referred to criminal (adult) court

Disposition: in the juvenile justice system, the outcome of an adjudication; comparable to a sentence in criminal court

> parents? Does the home or parent need correction or assistance? (d) What of environment and association, which, of course, may embrace substantively all of the points of study? How can the environment be improved? Certainly by keeping the child out of the saloon and away from evil examples. (e) Is the child afflicted with what we call "the moving about fever" – that is, is he given to playing "hookey" from school, or "bumming" and running away, showing an entire lack of ambition or desire to work and settle down to regular habits? [Ben B. Lindsey, "The Boy and the Court," *Charities* 13 (January 1905):352; cited in Platt (1977)]

Julian Mack, Chicago's second juvenile court judge, similarly described the ideal juvenile court proceeding:

> The problem for determination by the judge is not Has this boy or girl committed a specific wrong but What is he, how has he become what he is, and what had best be done in his interest and in the interest of the state to save him from a downward career. It is apparent at once that the ordinary legal evidence in a criminal court is not the sort of evidence to be heard in such a proceeding. (Mack 1909)

It is beyond the scope of this article to discuss the likely causes of the transformation of the juvenile justice system away from the rehabilitative ideal espoused by its founders and toward the more punitive regime that exists today (but see Scott & Steinberg 2008 for a discussion). However, it is worth noting that the early rhetoric on the rationale and purpose of the juvenile court is significant in two ways that bear on contemporary debates about justice system policy and practice. First, it is clear that the founders of the juvenile justice system began from the premise that adolescents are developmentally different from adults in ways that should affect our interpretation and assessment of their criminal acts. The questions raised by Judges Lindsey and Mack are relevant to the most vexing challenges that practitioners face today in determining (*a*) whether an adolescent's antisocial behavior is due to transient immaturity or contextual disadvantage, as opposed to deep-seated criminal character and (*b*) how best to construct a response to a juvenile's delinquent or criminal acts that will decrease the likelihood of recidivism. The difference between now and then, however, is that at the time of the court's founding, there was no science available to inform consideration of either issue. Owing to the dramatic increase in empirical research on normative and nonnormative adolescent development that began in the late 1970s, there has been a remarkable expansion of the scientific knowledge relevant to each of these matters.

Critical Decision Points Along the Juvenile Justice Pipeline

Juvenile justice is regulated mainly by state law, which makes it difficult to generalize about the system in ways that apply universally. Despite whatever differences exist across jurisdictions in policies and practices, however, the points of decision are essentially similar: referral, intake, detention, transfer, adjudication, disposition, and release (see Steinberg & Schwartz 2000).

Referral. Entrance into the pipeline begins with a referral to the juvenile justice system or a police arrest. Depending upon the state, a child may be too young or too old for the juvenile justice system. Children who are too young are most often diverted from the system or sent to the branch of juvenile court that has jurisdiction over neglected and abused children. Children who are too old are tried as adults. A juvenile may also be charged with an offense that results automatically in adult prosecution. If the juvenile is charged as an adult, most states allow for judges, after a hearing, to decide that the case should be transferred to juvenile court if the public interest requires it, or if the juvenile can prove that he or she is amenable to treatment in the juvenile justice system.

Intake. If the child enters the juvenile justice system after being arrested, referred by a private petitioner (such as a school or next-door neighbor), or transferred from criminal court, there will be an intake decision. Should the case proceed, or should the juvenile be diverted? If the latter, should it be an informal diversion, without further involvement by the juvenile court, or should the child be sent to a program, such as a community panel or teen court (and returned to juvenile court if he or she fails to obey a community-ordered disposition)? Some cases are diverted to other systems, such as the mental health system. Some cases are dropped entirely because intake officers decide that this particular combination of youth and offense does not belong in the juvenile justice system. Many factors thus enter into the decision to divert a case: The youth's age, prior history, the seriousness of the offense, and the youth's explanation or attitude will affect the intake decision.

Detention. If the intake officer decides that the case should proceed to a hearing, the officer must decide whether the child should be sent home (with or without supervision) or should be detained, either in a maximum-security detention center or in a detention alternative. Juveniles and their parents will need to explain to an intake officer how pretrial supervision will occur, and they will have to convince the officer that the juvenile will appear for trial. If the child is detained, there will be a court appearance within 24–72 hours. Most states call this first court appearance a detention hearing. Here a judge or referee will decide whether to continue the detention status. This is usually the first time that the child meets his or her attorney. Here the child must be able to discuss with counsel the circumstances of the arrest and out-of-court issues related to the detention decision (such as school attendance or the presence of an interested adult in the juvenile's life).

Transfer. Most persons under the age of 18 who are tried as adults are done so because of statutory exclusion of their case from the juvenile justice system. State law may exclude them because of their age—in New York, for example, a 16-year-old will be tried as an adult for any offense. Every state excludes some offenses from juvenile court jurisdiction if a child is of a certain age (for example, a state can decide that 15-year-olds who are charged with armed robbery will have their cases begin in adult criminal court). Some states permit prosecutors to file the juvenile's case directly in the adult system, where the juvenile may or may not have an opportunity to have the case transferred to juvenile court. Every state also allows judges to transfer children of a certain age—usually 14, but in some instances, even younger—to criminal court if they are charged with an offense as serious as a felony. States usually must prove that the juvenile is "not amenable to treatment" in the juvenile justice system. At transfer hearings, it is important that the juvenile is able, for example, to discuss with counsel his or her recent placement history and its reason for failure. He or she should be able to understand options, such as proposed placements, counseling programs, or plea agreements.

Adjudication. If the child continues to be detained within the juvenile justice system, an adjudicatory hearing (comparable to the trial in criminal court) must be held within 10–30 days. (Although this is the general rule, in some states juveniles charged with high-profile crimes such as murder will have a longer time to wait until their trials.) Demands on juveniles at adjudicatory hearings are many. They will include the need to understand the nature of the charges against them and to consult with counsel. They will have to weigh the costs and benefits of entering an admission (guilty plea). They should be able to help counsel identify potential witnesses, know whether an alibi or other defenses are available, and consult with counsel during cross-examination of state witnesses.

Disposition. If the juvenile admits to the offense, or if the juvenile court finds by proof beyond a reasonable doubt that the child has committed the offense, the court will proceed to disposition (sentence). Juveniles are

expected to assist counsel in presenting disposition options to the juvenile court. Assistance might include suggesting dispositions or helping the attorney and experts develop client-specific dispositions. Juvenile dispositions historically have been aimed at providing treatment, rehabilitation, or supervision in a way that best serves the needs of the juvenile, although in recent years some legislatures also have included incapacitation for public safety as a valid rationale. Under any of the models, the juvenile court will have a range of discretion. In some states, the juvenile court has wide latitude, from ordering that a child return home under supervision (probation) to placing a child in maximum-security institutions, known as training schools, reform schools, or youth development centers. In other states, which use a "youth authority" model, the court will either order probation or, if placement is warranted, transfer custody of the child to the youth authority, which will then determine the appropriate level of care.

Release. Most juvenile court dispositions are for indeterminate periods of time. However, dispositions cannot be for a longer period than an adult would serve for a similar crime in the criminal justice system. The court will usually review the juvenile's case every six to nine months. Sometimes the reviews are formal hearings, whereas in other instances they are informal reviews of reports provided by probation officers or institutional staff. Many juveniles in placement, particularly those with mental health needs or who have been placed in inappropriate placements, end up being returned to juvenile court for a new disposition. Most often, those juveniles are placed in detention pending a new placement plan. When juveniles are released from institutions, they are placed on aftercare probation, which is analogous to parole. A juvenile who is on probation or on aftercare probation status can have that status revoked, or "violated," for new offenses or for violating the terms of probation, such as associating with gang members, truancy, or missing curfew. A violation of probation may lead to rearrest, detention, and another hearing, the outcome of which may be a new disposition.

The Relevance of Developmental Science to Decision Making in the Justice System

Although there are few decision points in the pipeline where the developmental status of the juvenile is taken into account explicitly, at each decision juncture, information about the juvenile's stage of development should play an important role in the outcome of the decision. A juvenile's developmental status is relevant with respect to the adjudication process because a just and fair hearing requires the competent participation of the individual in his or her defense. As noted earlier, at both the adjudication and transfer hearings, certain competencies are expected to be in place, including those that potentially affect the juvenile's ability to understand the charges, assist counsel, and enter pleas (Scott & Grisso 2005). To the extent that these competencies are based on capabilities that develop over the course of childhood and adolescence, an accurate understanding of how and along what timetable these capabilities develop is crucial to deciding whether an individual possesses the skills necessary to participate in the process.

Under the law, characteristics of the offender and the circumstances of the offense can mitigate criminal responsibility and lessen the punishment that is ordered by the court. A crime that is committed impulsively is punished less severely than one that is premeditated, as is a crime that is committed under coercive pressure from others. Familiarity with the expected developmental timetables of phenomena such as self-control, foresight, and susceptibility to peer pressure is therefore important for making determinations of culpability. In theory at least, an offender who, by virtue of developmental immaturity, is impulsive, shortsighted, and easily influenced by peers should be punished less harshly than one who is better able to control himself, anticipate the future consequences of his behavior, and resist the

antisocial urgings of his friends (Steinberg & Scott 2003).

Finally, decision makers in the system often must assess the youngster's potential for change and risk for future offending when making transfer or disposition decisions (Mulvey & Leistico 2008). Such determinations of developmental plasticity are especially important at transfer hearings, because a youngster who is or seems hardened and unlikely to profit from rehabilitation is more likely to be charged as an adult than is one who is or is seen as malleable and amenable to intervention. Similarly, a juvenile who is deemed to be at high risk of recidivism, either because of a long prior record of offending or other characteristics associated with continued and/or dangerous criminal behavior (e.g., failure to respond to prior attempts at rehabilitation, a history of uncontrollable violence, or likelihood of inadequate adult supervision in the community), will be more likely to be sent to institutional placement.

In order to make well-informed decisions about the treatment of juveniles who have entered the juvenile justice pipeline, therefore, policy makers, practitioners, and mental health professionals need to be familiar with the developmental changes that occur during childhood and adolescence in the capabilities and characteristics that are relevant to competence, culpability, and likely response to treatment. Legislators need this information in order to create age-related laws and statutes that are developmentally appropriate and scientifically reasonable; if, for example, we know that the ability to understand charges or enter pleas does not generally develop until a certain age, it makes little sense to draw age boundaries that would subject developmentally incompetent individuals to court proceedings that necessitate their participation in order to satisfy ordinary due process requirements. Judges need this information in order to make wise and fair decisions in the courtroom; if we know that the capacity to regulate one's own behavior is unlikely to be present before a certain age, it is important that this information be taken into account at the time of sentencing or disposition. Mental health professionals need this information in order to perform accurate assessments and make appropriate treatment recommendations; individuals at different stages of development may need very different sorts of interventions. And attorneys need this information in order to practice law more effectively; prosecutors may consider a juvenile's developmental status in deciding when it is appropriate to charge an individual as an adult, and defense attorneys need to know how best to interact with clients who may not fully understand their situation. Understanding the nature of psychological development during adolescence, therefore, will likely improve policymaking, judicial decision making, forensic evaluation, and legal practice.

BRAIN, COGNITIVE, AND PSYCHOSOCIAL DEVELOPMENT IN ADOLESCENCE

When lawmakers focus on juvenile justice policy, the distinction between adolescence and adulthood, rather than that between childhood and adolescence, is of primary interest. However, most studies of adolescent development have compared adolescents with children, and only in recent years has scientific interest focused intensely on the psychological transition between adolescence and adulthood, largely in response to new research showing continued brain maturation through the end of the adolescent period. This work has provided support for the uniqueness of adolescence as a stage of life that is also distinct from adulthood with respect to several aspects of brain and psychosocial development.

Adolescent Brain Development

Although most of the developmental research on cognitive and psychosocial functioning during adolescence involves psychological studies, recent work in developmental neuroscience is beginning to shed light on the neural underpinnings of psychological development across adolescence and adulthood. In the past several years, a new perspective on risk taking

Socioemotional system: the brain system governing the processing of social and emotional information and the experience of reward and punishment

Cognitive control system: the brain system governing executive function, including deliberative thinking, impulse control, foresight, and the evaluation of risk and reward

(including antisocial risk taking) during adolescence has emerged, one that is informed by advances in developmental neuroscience (Casey et al. 2008, Steinberg 2008). According to this view, risky behavior in adolescence is the product of the interaction between changes in two distinct neurobiological systems: a socioemotional system, which is localized in limbic and paralimbic areas of the brain, including the amygdala, ventral striatum, orbitofrontal cortex, medial prefrontal cortex, and superior temporal sulcus; and a cognitive control system, which is mainly composed of the lateral prefrontal and parietal cortices and those parts of the anterior cingulate cortex to which they are interconnected (Steinberg 2007).

According to this dual-systems model, adolescent risk taking is hypothesized to be stimulated by a rapid and dramatic increase in dopaminergic activity within the socioemotional system around the time of puberty, which is presumed to lead to increases in reward seeking. However, this increase in reward seeking precedes the structural maturation of the cognitive control system and its connections to areas of the socioemotional system, a maturational process that is gradual, unfolds over the course of adolescence, and permits more advanced self-regulation and impulse control. The temporal gap between the arousal of the socioemotional system, which is an early adolescent development, and the full maturation of the cognitive control system, which occurs later, creates a period of heightened vulnerability to risk taking during middle adolescence (Steinberg 2008). As one writer has characterized it, the process may be akin to "starting the engines without a skilled driver behind the wheel" (Dahl 2001).

Neurobiological evidence in support of this dual-systems model is rapidly accumulating. A growing literature, derived primarily from rodent studies but with implications for human development, indicates that the remodeling of the dopaminergic system within the socioemotional network involves an initial postnatal rise and then, starting in preadolescence, a subsequent reduction of dopamine receptor density in the striatum and prefrontal cortex; this pattern is more pronounced among males than females (Sisk & Foster 2004, Sisk & Zehr 2005, Teicher et al. 1995). As a result of this remodeling, dopaminergic activity in the prefrontal cortex increases significantly in early adolescence and is higher during this period than before or after. Because dopamine plays a critical role in the brain's reward circuitry, the increase, reduction, and redistribution of dopamine receptor concentration around puberty, especially in projections from the limbic system to the prefrontal area, is likely to increase reward-seeking behavior and, accordingly, sensation seeking.

There is equally compelling neurobiological evidence for changes in brain structure and function during adolescence and early adulthood that facilitate improvements in self-regulation that permit individuals to modulate their inclinations to seek rewards, although this development is presumed to unfold along a different timetable and to be independent of puberty (see Paus 2005 for a summary). Because of synaptic pruning and the continued myelination of prefrontal brain regions, resulting in improved connectivity among cortical areas and between cortical and subcortical areas, there are improvements over the course of adolescence in many aspects of executive function, such as response inhibition, planning, weighing risks and rewards, and the simultaneous consideration of multiple sources of information. There is also improved coordination of affect and cognition, reflected in improved emotion regulation, which is facilitated by the increased connectivity between regions associated with the socioemotional and cognitive control systems.

The development of the cognitive control system, which is manifested chiefly in improved connectivity across brain regions, must be distinguished from the well-publicized maturation of the frontal lobes because of synaptic pruning. Although both processes result in improved thinking abilities, they occur at different times in adolescence and have different implications for cognitive development. Whereas increases in connectivity take place throughout adolescence and well into adulthood, the decline in gray matter density that reflects synaptic

pruning takes place in preadolescence and early adolescence and is more or less complete by age 16. Consequently, performance on tasks that activate the frontal lobes continues to improve through middle adolescence but not beyond age 16 on tasks of moderate difficulty (Conklin et al. 2007, Crone & van der Molen 2004, Hooper et al. 2004, Luna et al. 2001). In contrast, adult-like performance on more demanding cognitive tasks, especially those that require coordination between and among multiple cortical and subcortical brain regions, is not attained until later in development.

The upshot of this developmental neuroscience is that changes in the socioemotional system at puberty may promote reckless, sensation-seeking behavior in early and middle adolescence, while the regions of the prefrontal cortex that govern cognitive control continue to mature over the course of adolescence and into young adulthood. This temporal gap between the increase in sensation seeking around puberty and the later development of mature self-regulatory competence may combine to make adolescence a time of inherently immature judgment. Thus, despite the fact that in many ways adolescents may appear to be as intelligent as adults (at least as indexed by performance on tests of information processing and logical reasoning), their ability to regulate their behavior in accord with these advanced intellectual abilities is more limited. As the next section makes clear, research on adolescent cognitive and psychosocial development is consistent with this neurobiological profile.

Adolescent Cognitive Development

The application of information about normative adolescent development to policy and practice in the justice system necessitates differentiating between cognitive and psychosocial development, which appear to follow different developmental trajectories (Steinberg 2008). Briefly, on relatively less-demanding tasks that are mainly or exclusively cognitive in nature, and where improvement in adolescence is likely due to synaptic pruning of the frontal lobes, adolescents evince adult levels of competence by age 16. In contrast, on more challenging tasks that involve the coordination of affect and cognition, and on many measures of psychosocial maturity, performance continues to improve well into young adulthood, most likely because this improvement is mediated by improved connectivity across brain regions, a relatively later development. As I discuss below, this temporal disjunction has created a great deal of confusion with regard to where we should draw the legal boundary between adolescence and adulthood, because different developmental literatures suggest different chronological ages.

The most important cognitive capacities involved in decision making are understanding (i.e., the ability to comprehend information relevant to the decision) and reasoning (i.e., the ability to use this information logically to make a choice). These capacities increase through childhood into adolescence. Between late childhood and middle adolescence (roughly between the ages of 11 and 16), individuals show marked improvements in reasoning (especially deductive reasoning) and in both the efficiency and capacity of information processing (Hale 1990, Kail 1997, Keating 2004, Overton 1990). Research has demonstrated conclusively that, as a result of gains in these areas, individuals become more capable of abstract, multidimensional, deliberative, and hypothetical thinking as they develop from late childhood into middle adolescence (Kuhn 2009). These abilities reach an asymptote sometime around 16, and by this age, teens' capacities for understanding and reasoning in making decisions, at least in controlled experiments, roughly approximate those of adults. This comparability between middle adolescents and adults is not limited to basic cognitive abilities such as memory or verbal fluency or to performance on tasks of logical reasoning. Studies of capacity to grant informed consent to receive medical treatment or participate as a research subject, for example, show little improvement beyond age 16 (Belter & Grisso 1984, Grisso & Vierling 1978, Gustafson & McNamara 1987, Weithorn & Campbell 1982).

The notion that adolescents and adults demonstrate comparable capacities for understanding and reasoning should not be taken to mean that they also demonstrate comparable levels of maturity of judgment, however. As my colleagues and I have argued elsewhere, maturity of judgment is affected both by cognitive capabilities as well as psychosocial ones, and although the former show adult levels of maturity by 16, the latter do not (Steinberg et al. 2009). As a result, adolescents may be less able to deploy their cognitive capacities as effectively as adults in exercising judgment in their everyday lives when decisions are influenced by emotional and social variables. The development of these psychosocial factors is described in the next section.

Adolescent Psychosocial Development

New perspectives on adolescent "cognition-in-context" emphasize that adolescent thinking in everyday settings is a function of social and emotional, as well as cognitive, processes, and that a full account of youthful judgment must examine the interaction of all of these influences (Scott et al. 1995, Steinberg & Cauffman 1996). Even when adolescent cognitive capacities approximate those of adults, youthful decision making may still differ from that of adults due to psychosocial immaturity. Indeed, research indicates that psychosocial maturation proceeds more slowly than cognitive development and that age differences in judgment may reflect social and emotional differences between adolescents and adults that continue well beyond mid-adolescence. Of particular relevance to the present discussion are age differences in susceptibility to peer influence, future orientation, reward sensitivity, and the capacity for self-regulation. Available research indicates that adolescents and adults differ significantly with respect to each of these attributes.

Peer influence. Substantial research evidence supports the conventional wisdom that teens are more oriented toward peers and responsive to peer influence than are adults (Steinberg & Monahan 2007). Resistance to peer influence increases between adolescence and adulthood as individuals begin to form an independent sense of self and develop greater capacity for autonomous decision making. Studies of age differences and age changes in resistance to peer influence suggest somewhat different patterns vis-à-vis antisocial versus neutral or prosocial peer pressure prior to middle adolescence (with resistance to antisocial influence decreasing during this time, especially among boys, but resistance to other forms of peer influence increasing), but similar patterns after age 14 (with resistance to all forms of peer influence increasing). Because the main justice policy and practice questions concern differences between adolescents and adults, especially during the latter part of the adolescent period, it is this increase in resistance to peer influence from age 14 on that is of particular interest.

Recent studies of the neural underpinnings of resistance to peer influence in adolescence indicate that improvements in this capacity may be linked to the development of greater connectivity between cortical and subcortical regions, which likely facilitates the better coordination of affect and cognition (Grosbras et al. 2007, Paus et al. 2008), although it should be noted that this conclusion is based on studies of individual differences in brain morphology and function among same-aged adolescents who differ in their self-reported resistance to peer pressure and not to cross-sectional or longitudinal studies that link age differences in resistance to peer influence to age differences in brain structure or function. Nevertheless, it is reasonable to speculate that the social and arousal processes that may undermine logical decision making during adolescence, when connectivity is still maturing, do not have the same impact during adulthood. One recent behavioral study found, for instance, that adolescents, college undergraduates, and adults performed similarly on a risk-taking task when performing the task alone, but that the presence of same-aged friends doubled risk taking among the adolescents and increased it 50% among the undergraduates, but had no

impact on the adults (Gardner & Steinberg 2005).

Peer influence affects adolescent judgment both directly and indirectly. In some contexts, adolescents might make choices in response to direct peer pressure, as when they are coerced to take risks that they might otherwise avoid. More indirectly, adolescents' desire for peer approval and consequent fear of rejection affects their choices even without direct coercion. The increased salience of peers in adolescence likely makes approval seeking especially important in group situations. Thus, it is not surprising, perhaps, that adolescents are far more likely than are adults to commit crimes in groups (Zimring 1998). Peers also may provide models for behavior that adolescents believe will assist them to accomplish their own ends. For example, there is some evidence that during early and middle adolescence, teens who engage in certain types of antisocial behavior, such as fighting or drinking, may enjoy higher status among their peers as a consequence. Accordingly, some adolescents may engage in antisocial conduct to impress their friends or to conform to peer expectations; indeed, in one of the most influential accounts of so-called adolescence-limited offenders (that is, individuals who commit crimes during adolescence but not before or after), imitation of higher-status peers is hypothesized to be a prime motivation for antisocial behavior (Moffitt 1993).

Future orientation. Future orientation, the capacity and inclination to project events into the future, may also influence judgment because it affects the extent to which individuals consider the long-term consequences of their actions in making choices. Over the course of adolescence and into young adulthood, individuals become more future oriented, with increases in their consideration of future consequences, in their concern about the future, and in their ability to plan ahead (Greene 1986, Nurmi 1991, Steinberg et al. 2008b).

There are several plausible explanations for this age gap in future orientation. In part, adolescents' weaker future orientation may reflect their more limited life experience (Gardner 1993). To a young person, a short-term consequence may have far greater salience than one five years in the future. The latter may seem very remote simply because five years represents a substantial portion of her life. There is also evidence linking the differences between adolescents and adults in future orientation to age differences in brain structure and function, especially in the prefrontal cortex (Cauffman et al. 2005).

Adolescence-limited offenders: antisocial individuals whose offending begins and ends during adolescence

Reward sensitivity. Research evidence also suggests that, relative to adults, adolescents are more sensitive to rewards and, especially, to immediate rewards, a difference that may explain age differences in sensation seeking and risk taking (Galvan et al. 2007, Steinberg et al. 2008a). Although it had once been believed that adolescents and adults differ in risk perception, it now appears that age differences in risk taking are more likely mediated by age differences in reward sensitivity than by age differences in sensitivity to the potential adverse consequences of a risky decision (Cauffman et al. 2008, Millstein & Halpern-Felsher 2002). Thus, adolescents and adults may perceive risks similarly (both in the lab and in the real world) but evaluate rewards differently, especially when the benefits of the risky decision are weighed against the costs. So, for example, in deciding whether to speed while driving a car, adolescents and adults may estimate the risks of this behavior (e.g., being ticketed, getting into an accident) similarly, but adolescents may weigh the potential rewards (e.g., the thrill of driving fast, peer approval, getting to one's destination sooner) more heavily than adults, leading to lower risk ratios for teens—and a higher likelihood of engaging in the (rewarding) activity. Thus, what distinguishes adolescents from adults in this regard is not the fact that teens are less knowledgeable about risks, but rather that they attach greater value to the rewards that risk taking provides (Steinberg 2004).

The heightened salience of rewards to adolescents, relative to adults, is seen in age

differences in performance on the Iowa Gambling Task, in which subjects are given four decks of cards, face down, and are instructed to turn over cards, one at a time, from any deck. Each card has information about how much money the subject has won or lost by selecting that card. Two of the decks are "good," in that drawing from them will lead to gains over time, and two of the decks are "bad"; drawing from them will produce net losses. Because a few cards in the "bad" decks offer very high rewards, though, a person who is especially sensitive to rewards will be drawn to the "bad" decks, even if he or she keeps losing money as a result. At the beginning of the task, people tend to draw randomly from all four decks, but as the task progresses, normal adults pick more frequently from the good decks. Children and younger adolescents (as well as adults with damage to the ventromedial prefrontal cortex) do poorly on this task (Crone et al. 2005, Crone & van der Molen 2004, Hooper et al. 2004). Performance improves with age, with the most dramatic improvement taking place during middle adolescence. This likely reflects a decrease in susceptibility to choosing based on the prospect of an immediate, attractive reward. Further evidence that adolescents tend to value immediate rewards more than adults do is seen in age differences in performance on tests of delay discounting, in which individuals are asked to chose between a smaller immediate reward (e.g., receiving $600 tomorrow) and a larger delayed one (e.g., receiving $1000 in one year) (Steinberg et al. 2008b). Heightened reward sensitivity, indexed by self-report or task performance, is especially pronounced during early and middle adolescence, when reward circuitry in the brain is undergoing extensive remodeling. There is some evidence from both human and animal studies that this may be linked to pubertal maturation (Dahl 2004).

Self-regulation. In addition to age differences in susceptibility to peer influence, future orientation, and reward sensitivity, adolescents and adults also differ with respect to their ability to control impulsive behavior and choices. Thus, the widely held stereotype that adolescents are more reckless than adults is supported by research on developmental changes in impulsivity and self-management over the course of adolescence (Galvan et al. 2007, Leshem & Glicksohn 2007). In general, studies show gradual but steady increases in the capacity for self-direction through adolescence, with gains continuing through the high school years and into young adulthood. Similarly, impulsivity, as a general trait, declines linearly between adolescence and adulthood (Steinberg et al. 2008a).

An illustration of behavioral research that sheds light on age differences in impulse control is the study of performance on a task known as the Tower of London. In this test, the subject is presented with an arrangement of colored balls, stacked in a certain order, and several empty vertical rods onto which the balls can be moved. The subject is then presented with a picture of a different configuration of balls and asked to turn the original configuration into the new one by moving one ball at a time, using the fewest number of moves (Berg & Byrd 2002). This task requires thinking ahead, because extra moves must be used to undo a mistake. In several studies, our research group found that early and middle adolescents performed similarly to adults when the problem presented was an easy one (i.e., one that could be solved in two or three moves), but that they did not plan ahead as much as late adolescents and young adults on the harder problems; unlike the older subjects, the younger individuals spent no more time before making their first move on the complex problems than they did on the simple ones (Steinberg et al. 2008a). These findings are consistent with casual observations of teenagers in the real world, which also suggest that they are less likely than are adults to think ahead before acting.

Taken together, these findings from self-report and behavioral studies of psychosocial development indicate that individuals become more resistant to peer influence and oriented to the future, and less drawn to immediate rewards and impulsive, as they mature from adolescence to adulthood. Although the science of

adolescent brain development is still in its infancy, findings indicate that much of this maturation continues well beyond the age by which individuals evince adult levels of performance on tests of cognitive capacity. As I discuss in the next section, the continued maturation of cognitive competence through age 16 and the continued maturation of psychosocial competence into young adulthood have important implications for how we view and respond to the criminal behavior of juveniles.

JUVENILE JUSTICE ISSUES INFORMED BY DEVELOPMENTAL SCIENCE

Criminal Culpability of Youth

The adult justice system presumes that defendants who are found guilty are responsible for their own actions, should be held accountable, and should be punished accordingly. Because of the relative immaturity of minors, however, it may not be justified to hold them as accountable as one might hold adults. If, for example, adolescents below a certain age cannot grasp the long-term consequences of their actions or cannot control their impulses, one cannot hold them fully accountable for their actions. In other words, we cannot claim that adolescents "ought to know better" if, in fact, the evidence indicates that they do not know better, or more accurately, cannot know better, because they lack the abilities needed to exercise mature judgment. It is important to note that culpability cannot really be researched directly. Because an individual's culpability is something that is judged by someone else, it is largely in the eye of the beholder. What can be studied, however, are the capabilities and characteristics of individuals that make them potentially blameworthy, such as their ability to behave intentionally or to know right from wrong.

I use the term "culpability" in this review as a shorthand for several interrelated phenomena, including responsibility, accountability, blameworthiness, and punishability. These notions are relevant to the adjudication of an individual's guilt or innocence, because an individual who is not responsible for his or her actions by definition cannot be guilty, and to the determination of a disposition (in juvenile court) or sentence (in criminal court), in that individuals who are found guilty but less than completely blameworthy, owing to any number of mitigating circumstances, merit proportionately less punishment than do guilty individuals who are fully blameworthy.

The starting point in a discussion of criminal culpability is a principle known as penal proportionality. Simply put, penal proportionality holds that criminal punishment should be determined by two criteria: the harm a person causes and his blameworthiness in causing that harm. The law recognizes that different wrongful acts cause different levels of harm through a complex system of offense grading under which more serious crimes (rape, for example) are punished presumptively more severely than less serious crimes (shoplifting, for example). Beyond this, though, two people who engage in the same wrongful conduct may differ in their blameworthiness. A person may be less culpable than other criminals—or not culpable at all—because he inadvertently (rather than purposely) causes the harm, because he is subject to some endogenous deficiency or incapacity that impairs his decision making (such as mental illness), or because he acts in response to an extraordinary external pressure—a gun to the head is the classic example. Less-blameworthy offenders deserve less punishment, and some persons who cause criminal harm deserve no punishment at all (Scott & Steinberg 2008).

The concept of mitigation plays an important role in the law's calculation of blame and punishment, although it gets little attention in the debate about youth crime. Mitigation applies to persons engaging in harmful conduct who are blameworthy enough to meet the minimum threshold of criminal responsibility but who deserve less punishment than a typical offender would receive. Through mitigation, the criminal law calculates culpability and punishment along a continuum and is not limited to the options of full responsibility or complete

Penal proportionality: the principle in American criminal law linking the severity of punishment for a crime to the criminal's culpability

Mitigation: in criminal law, the lessening of criminal responsibility

excuse. Indeed, criminal law incorporates calibrated measures of culpability. For example, the law of homicide operates through a grading scheme under which punishment for killing another person varies dramatically depending on the actor's blameworthiness. Thus, the actor who kills intentionally is deemed less culpable if he does so without premeditation because his choice reveals less consideration of the harmful consequences of his act, and the actor who negligently causes another's death is guilty of a less serious crime than one who intends to kill. A person who kills in response to provocation or under extreme emotional disturbance may be guilty only of manslaughter and not of murder. Under standard homicide doctrine, mitigating circumstances and mental states are translated into lower-grade offenses that warrant less punishment.

What makes the conduct of one person less blameworthy than that of another person who causes the same harm? Generally, a person who causes criminal harm is a fully responsible moral agent (and deserves full punishment) if, in choosing to engage in the wrongful conduct, he has the capacity to make a rational decision and a "fair opportunity" to choose not to engage in the harmful conduct. Under this view, the actor whose thinking is substantially impaired or whose freedom is significantly constrained is less culpable than is the typical offender and deserves less punishment—how much less depends on the extent of the impairment or coercion. Under American criminal law, two very different kinds of persons can show that their criminal conduct was less culpable than that of the offender who deserves full punishment—those who are very different from ordinary persons due to impairments that contributed to their criminal choices and those who are ordinary persons whose offenses are responses to extraordinary circumstances or are otherwise aberrant conduct (Scott & Steinberg 2008).

Although it seems paradoxical, adolescents, in a real sense, belong to both groups. In the first group are individuals with endogenous traits or conditions that undermine their decision-making capacity, impairing their ability to understand the nature and consequences of their wrongful acts or to control their conduct. In modern times, this category has been reserved mostly for offenders who suffer from mental illness, mental disability, and other neurological impairments. The criminal law defenses of insanity, diminished capacity, extreme emotional disturbance, and involuntary act recognize that psychological and biological incapacities can undermine decision making in ways that reduce or negate the culpability of criminal choices.

Individuals in the second group are ordinary persons whose criminal conduct is less culpable because it is a response to extraordinary external circumstances: These cases arise when the actor faces a difficult choice, and his response of engaging in the criminal conduct is reasonable under the circumstances, as measured by the likely response of an ordinary law-abiding person in that situation. Thus, under standard self-defense doctrine, a person who kills a threatening assailant is excused from liability if a reasonable person in his place would have felt that his life was in danger. Similarly, the defenses of duress, necessity, and provocation are available to actors who can explain their criminal conduct in terms of unusual external pressures that constrained their ability to choose.

In the preceding section, I described aspects of psychological development in adolescence that are relevant to youthful choices to get involved in criminal activity and that may distinguish young offenders from their adult counterparts. Although youths in mid-adolescence have cognitive capacities for reasoning and understanding that approximate those of adults, even at age 18 adolescents are immature in their psychosocial and emotional development, and this likely affects their decisions about involvement in crime in ways that distinguish them from adults. Teenagers are more susceptible to peer influence than are adults and tend to focus more on rewards and less on risks in making choices. They also tend to focus on short-term rather than long-term consequences and are less capable of anticipating future consequences, and they are more impulsive and volatile in their emotional responses. When we consider these

developmental factors within the conventional criminal law framework for assessing blameworthiness, the unsurprising conclusion is that adolescent offenders are less culpable than are adults. The mitigating conditions generally recognized in the criminal law—diminished capacity and coercive circumstances—are relevant to criminal acts of adolescents and often characterize the actions of juvenile offenders. This does not excuse adolescents from criminal responsibility, but it renders them less blameworthy and less deserving of adult punishment.

Although in general lawmakers have paid minimal attention to the mitigating character of adolescents' diminished decision-making capacities, some legislatures and courts have recognized that immature judgment reduces culpability. Most notably, in its consideration of the constitutionality of the juvenile death penalty, the Supreme Court has focused on this rationale for mitigation. In *Roper v. Simmons*, the 2005 case that abolished the juvenile death penalty, the Court adopted the developmental argument for mitigation that follows from the research reviewed above. Justice Kennedy, writing for the majority, described three features of adolescence that distinguish young offenders from their adult counterparts in ways that mitigate culpability—features that are familiar to the reader at this point. The first is the diminished decision-making capacity of youths, which may contribute to a criminal choice that is "not as morally reprehensible as that of adults" because of its developmental nature. The Court pointed to the tendency of adolescents to engage in risky behavior and noted that immaturity and an "underdeveloped sense of responsibility" often result in "impetuous and ill-considered decisions" by youths. Second, the Court pointed to the increased vulnerability of youths to external coercion, including peer pressure. Finally, the Court emphasized that the unformed nature of adolescent identity made it "less supportable to conclude that even a heinous crime was evidence of irretrievably depraved character." Adolescents are less blameworthy than are adults, the Court suggested, because the traits that contribute to criminal conduct are transient, and because most adolescents will outgrow their tendency to get involved in crime as they mature. Although the Court did not elaborate, we have seen that each of these attributes of adolescence corresponds to a conventional source of mitigation in criminal law (*Roper v. Simmons* 2005).

***Roper v. Simmons*:** the U.S. Supreme Court case that abolished the juvenile death penalty

Does this argument apply to the conduct of immature adults? Although most impulsive young risk takers mature into adults with different values, some adult criminals are impulsive, sensation-seeking risk takers who discount future consequences and focus on the here and now. Are these adolescent-like adults also less culpable than other adult offenders and deserving of reduced punishment? I think not. Unlike the typical adolescent, the predispositions, values, and preferences that motivate the adult offenders are not developmental but characterological, and they are unlikely to change merely with the passage of time. Adolescent traits that contribute to criminal conduct are normative of adolescence, but they are not typical in adulthood. In an adult, these traits are often part of the personal identity of an individual who does not respect the values of the criminal law and who deserves punishment when he or she violates its prohibitions (Scott & Steinberg 2008).

Competence of Adolescents to Stand Trial

Before discussing adolescents' competence to stand trial, it is worth underscoring the distinction between competence and culpability—two very different constructs that are often confused, even by those with expertise in criminal law. Competence to stand trial refers to the ability of an individual to function effectively as a defendant in a criminal or delinquency proceeding. In contrast, determinations of culpability focus on the defendant's blameworthiness in engaging in the criminal conduct and on whether and to what extent he will be held responsible. Although many of the same incapacities that excuse or mitigate criminal responsibility may also render a defendant incompetent, the two issues are analytically distinct and

separate legal inquiries, and they focus on the defendant's mental state at two different points in time (the time of the crime and the time of the court proceeding).

The reason that competence is required of defendants in criminal proceedings is simple: When the state asserts its power against an individual with the goal of taking away his liberty, the accused must be capable of participating in a meaningful way in the proceeding against him. If a defendant is so mentally ill or disabled that he cannot participate adequately, then the trial lacks fundamental fairness that is required as a part of due process under the Fourteenth Amendment to the U.S. Constitution (Scott & Grisso 2005).

In 1960, the Supreme Court announced a legal standard for trial competence in *Dusky v. United States* that has since been adopted uniformly by American courts. According to *Dusky*, when the issue of a defendant's competence is raised in a criminal trial, the court's determination should focus on "whether the defendant has sufficient present ability to consult with his lawyer with a reasonable degree of rational understanding—and whether he has a rational, as well as factual, understanding of the proceedings against him." Thus, there are two parts to the competence requirement: The defendant must be able to consult with her attorney about planning and making decisions in her defense, and she must understand the charges, the meaning, and purpose of the proceedings and the consequences of conviction (Scott & Grisso 2005).

The requirement that criminal defendants be competent to stand trial had no place in delinquency proceedings in the traditional juvenile court. In a system in which the government's announced purpose was to rehabilitate and not to punish errant youths, the procedural protections accorded adult defendants—including the requirement of adjudicative competence—were thought to be unnecessary. This all changed with *In re Gault*, which led to an extensive restructuring of delinquency proceedings to conform to the requirements of constitutional due process. Today, it is generally accepted that requirements of due process and fundamental fairness are satisfied only if youths facing charges in juvenile court are competent to stand trial.

Until the 1990s, the issue of juveniles' trial competence involved a straightforward incorporation into delinquency proceedings of a procedural protection that was relevant to a relatively small number of mentally impaired adult defendants, where it was assumed to apply similarly to a small number of mentally incapacitated youths. The regulatory reforms that began in the late 1980s changed the situation by increasing the punishment stakes facing many young offenders and by eroding the boundary between the adult and juvenile systems. The importance of this issue was not recognized immediately, however. As legislatures across the country began to enact laws that dramatically altered the landscape of juvenile crime policy, the procedural issue of whether developmentally immature youngsters charged with crimes might be less able to participate in criminal proceedings than are adult defendants—what is referred to in this article as developmental incompetence—was not central to the policy debates.

Given that developmental incompetence largely escaped the attention of courts and policy makers until recently, it is worth asking directly whether the constitutional prohibition against criminal adjudication of incompetent defendants must be applied to this form of incapacity. The answer is surely "yes." The competence requirement is functional at its core, speaking to questions about the impact of cognitive deficiencies on trial participation. Functionally it makes no difference if the defendant cannot understand the proceeding she faces or assist her attorney, whether due to mental illness or to immaturity (Scott & Grisso 2005). In either case, the fairness of the proceeding is undermined. In short, the same concerns that support the prohibition against trying criminal defendants who are incompetent due to mental impairment apply with equal force when immature youths are subject to criminal proceedings. In the context of the recent changes in juvenile

***Dusky v. United States*:** the U.S. Supreme Court case that established criteria for competence to stand trial

***In re Gault*:** the U.S. Supreme Court case that determined that juveniles adjudicated in juvenile court were entitled to many of the same procedural protections as adults adjudicated in criminal court

Developmental incompetence: a lack of competence to stand trial due to normal cognitive or psychosocial immaturity, as opposed to mental illness or disability

justice policy, it has become important to have a better understanding of how the capacities of children and adolescents to participate in criminal proceedings compare with those of adults. In pursuit of this end, I first examine the specific abilities that are required for adjudicative competence under the legal standard. I then turn to the research directly comparing the abilities of juveniles and adults.

Three broad types of abilities are implicated under the *Dusky* standard for competence to stand trial: (*a*) a factual understanding of the proceedings, (*b*) a rational understanding of the proceedings, and (*c*) the ability to assist counsel (Scott & Grisso 2005). Courts applying the standard are directed to weigh each factor, but otherwise they exercise substantial discretion in deciding how much competence is enough. Examining each component of competence under the *Dusky* standard and considering how the capacities of juvenile defendants are likely to compare with those of adults is instructive.

Factual understanding focuses on the defendant's knowledge and awareness of the charges and his understanding of available pleas, possible penalties, the general steps in the adjudication process, the roles of various participants in the pretrial and trial process, and his rights as a defendant. Intellectual immaturity in juveniles may undermine factual understanding, especially given that youths generally have less experience and more limited ability to grasp concepts such as rights. Juveniles also may be more likely than are adults to have extensive deficits in their basic knowledge of the trial process, such that more than brief instruction is needed to attain competence.

The rational understanding requirement of *Dusky* has been interpreted to mean that defendants must comprehend the implications, relevance, or significance of what they understand factually regarding the trial process. Deficits in rational understanding typically involve distorted or erroneous beliefs that nullify factual understanding. For example, an immature defendant may know that he has a right to remain silent, yet believe that the judge can take this "right" away at any time by demanding a response to questions. (When asked what he thought the "right to remain silent" meant, my 12-year-old son said, "It means that you don't have to say anything until the police ask you a question.") Intellectual, emotional, and psychosocial immaturity may undermine the ability of some adolescents to grasp accurately the meaning and significance of matters that they seem to understand factually.

Finally, the requirement that the defendant in a criminal proceeding must have the capacity to assist counsel encompasses three types of abilities. The first is the ability to receive and communicate information adequately to allow counsel to prepare a defense. This ability may be compromised by impairments in attention, memory, and concentration, deficits that might undermine the defendant's ability to respond to instructions or to provide important information to his attorney, such as a coherent account of the events surrounding the offense. As I noted above, these capacities continue to improve through age 16, according to studies of cognitive development. Second, the ability to assist counsel requires a rational perspective regarding the attorney and her role, free of notions or attitudes that could impair the collaborative relationship. For example, a young defendant may develop a belief that all adults involved in the proceeding are allied against him, perhaps after seeing defense attorneys and prosecutors chatting together outside the courtroom. Third, defendants must have the capacity to make decisions about pleading and the waiver or assertion of other constitutional rights. These decisions involve not only adequate factual and rational understanding, but also the ability to consider alternatives and make a choice in a decision-making process. Immature youths may lack capacities to process information and exercise reason adequately in making trial decisions, especially when the options are complex and their consequences far reaching.

As juveniles' competence to stand trial began to emerge as an important issue in the mid-1990s, the need for a comprehensive study comparing the abilities of adolescents

and adults in this realm became apparent. Before this time, a few small studies had looked at particular capacities in juveniles that were important at different stages in the justice process. However, no comprehensive research had compared the specific capacities of juveniles and adults that are directly implicated in assessments of adjudicative competence. In response to that need, the MacArthur Foundation Research Network on Adolescent Development and Juvenile Justice sponsored a large-scale study of individuals between the ages of 11 and 24—half of whom were in the custody of the justice system and half of whom had never been detained—designed to examine empirically the relationship between developmental immaturity and the abilities of young defendants to participate in their trials (Grisso et al. 2003). The study also probed age differences in psychosocial influences on decision making in the criminal process.

Based on participants' responses to a structured interview that had been used in previous studies of competence to stand trial among mentally ill adults, and for which norms had been established to define clinically significant "impairment," the researchers found that competence-related abilities improve significantly between the ages of 11 and 16. On average, youths aged 11 to 13 demonstrated significantly poorer understanding of trial matters, as well as poorer reasoning and recognition of the relevance of information for a legal defense, than did 14- and 15-year-olds, who in turn performed significantly more poorly than individuals aged 16 and older. There were no differences between the 16- and 17-year-olds and the young adults. The study produced similar results when adolescents and adults were categorized according to their scores above and below the cut-off scores indicating impairment. Nearly one-third of 11- to 13-year-olds and about one-fifth of 14- and 15-year-olds, but only 12% of individuals 16 and older, evidenced impairment at a level comparable to mentally ill adults who had been found incompetent to stand trial with respect to either their ability to reason with facts or understand the trial process. Individual performance did not differ significantly by gender, ethnicity, or, in the detained groups, as a function of the extent of individuals' prior justice system experience. This last finding is important because it indicates that there are components of immaturity independent of a lack of relevant experience that may contribute to elevated rates of incompetence among juveniles.

A different structured interview was used to probe how psychosocial influences affect decision making by assessing participants' choices in three hypothetical legal situations involving a police interrogation, consultation with a defense attorney, and the evaluation of a proffered plea agreement. Significant age differences were found in responses to police interrogation and to the plea agreement. First, youths, including 16- to 17-year-olds, were much more likely to recommend waiving constitutional rights during an interrogation than were adults, with 55% of 11- to 13-year-olds, 40% of 14- to 15-year-olds, and 30% of 16- to 17-year-olds choosing to "talk and admit" involvement in an alleged offense (rather than "remaining silent"), but only 15% of the young adults making this choice. There were also significant age differences in response to the plea agreement. This vignette was styled so as not to clearly favor accepting or rejecting the state's offer, which probably accounted for the fact that young adults were evenly divided in their responses. In contrast, 75% of the 11- to 13-year-olds, 65% of the 14- to 15-year-olds, and 60% of the 16- to 17-year-olds recommended accepting the plea offer. Together, these results suggest a much stronger tendency for adolescents than for young adults to make choices in compliance with the perceived desires of authority figures (Grisso et al. 2003).

Analysis of participants' responses to the vignettes also indicated differences between the youngest age group and older subjects in risk perception and future orientation. Participants were asked to explain their choices, including their perceptions about positive and negative consequences of various options; questions probed the subjects' assessment of the

seriousness of risks (the perceived negative consequences) and the likelihood of risks materializing. Analyses indicated age differences for all of these dimensions of "risk perception," with the 11- to 13-year-olds less able to see risks than 16- to 17-year-olds and young adults. Similarly, in comparison with older adolescents, fewer 11- to 13-year-olds mentioned the long-range consequences of their decisions, which suggests that future orientation differences exist that are consistent with those described above.

The study's findings are consistent with those of earlier studies that examined various dimensions of youths' functioning in the justice system. For example, an important study of youths' and adults' capacities to understand Miranda rights in the early 1980s found that, compared with adults in the criminal justice system, 14-year-olds in juvenile detention were less able to understand the meaning and importance of *Miranda* warnings (Grisso 1981). Other studies using smaller samples also have found age differences across the adolescent years with regard to knowledge of legal terms and the legal process in delinquency and criminal proceedings (e.g., Cooper 1997). Finally, a series of studies found significant age differences across the adolescent years in "strategic thinking" about pleas; older adolescents were more likely than younger subjects to make choices that reflected calculations of probabilities and costs based on information provided (e.g., Peterson-Badali & Abramovitch 1993).

In light of what is known about psychological maturation in early and mid-adolescence, these findings are not surprising. Indeed, given the abilities required of defendants in criminal proceedings, it would be puzzling if youths and adults performed similarly on competence-related measures. This research provides powerful and tangible evidence that some youths facing criminal charges may function less capably as criminal defendants than do their adult counterparts. This does not mean, of course, that all youths should be automatically deemed incompetent to stand trial any more than would a psychiatric diagnosis or low IQ score. It does mean, however, that the risk of incompetence is substantially elevated in early and mid-adolescence; it also means that policy makers and practitioners must address developmental incompetence as it affects the treatment of juveniles in court (Scott & Grisso 2005).

It is important to emphasize that the pattern of age differences in studies of legal decision making more closely resembles that seen in studies of cognitive development (where few age differences are apparent after 16) than in studies of psychosocial development (where age differences are observed in late adolescence and sometimes in young adulthood). This suggests that determinations of where to draw a legal boundary between adolescence and adulthood must be domain specific. In matters in which cognitive abilities predominate, and where psychosocial factors are of minimal importance (that is, in situations where the influence of adolescents' impulsivity, susceptibility to peer pressure, reward sensitivity, and relatively weaker future orientation is mitigated), adolescents older than 15 should probably be treated like adults. In situations in which psychosocial factors are substantially more important, drawing the boundary at an older age is more appropriate. This is why my colleagues and I have argued that it is perfectly reasonable to have a lower boundary for adolescents' autonomous access to abortion (a situation in which mandatory waiting periods limit the impact of impulsivity and shortsightedness and where consultation with adults likely counters immaturity of judgment) than for judgments of criminal responsibility (because adolescents' crimes are often impulsive and influenced by peers) (Steinberg et al. 2009).

Impact of Punitive Sanctions on Adolescent Development and Behavior

As noted above, the increasingly punitive orientation of the justice system toward juvenile offenders has resulted in an increase in the number of juveniles tried and sanctioned as adults and in the use of harsher sanctions in responding to the delinquent behavior of juveniles who have been retained in the juvenile justice

Life-course-persistent offenders: antisocial individuals whose offending begins before adolescence and persists into adulthood

Age-crime curve: in criminology, the relation between age and crime, showing that the prevalence of criminal activity increases between preadolescence and late adolescence, peaks around age 17, and declines thereafter

system. Research on the impact of adult prosecution and punishment and on the use of punitive sanctions more generally suggests, however, that these policies and practices may actually increase recidivism and jeopardize the development and mental health of juveniles (Fagan 2008). Consequently, there is a growing consensus among social scientists that policies and practices, such as setting the minimum age of criminal court jurisdiction below 18 (as about one-third of all states currently do), transferring juveniles to the adult system for a wide range of crimes, including nonviolent crimes, relying on incarceration as a primary means of crime control, and exposing juvenile offenders to punitive programs such as boot camps, likely do more harm than good, cost taxpayers much more than they need spend on crime prevention, and ultimately pose a threat to public safety (Greenwood 2006).

In order to understand why this is the case, it is important to begin with a distinction between adolescence-limited and life-course-persistent offenders (Moffitt 1993). Dozens of longitudinal studies have shown that the vast majority of adolescents who commit antisocial acts desist from such activity as they mature into adulthood and that only a small percentage—between five and ten percent, according to most studies—become chronic offenders. Thus, nearly all juvenile offenders are adolescent limited. This observation is borne out in inspection of what criminologists refer to as the age-crime curve, which shows that the incidence of criminal activity increases between preadolescence and late adolescence, peaks at about age 17 (slightly younger for nonviolent crimes and slightly older for violent ones), and declines thereafter. These findings, at both the individual and aggregate level, have emerged from many studies that have been conducted in different historical epochs and around the world (Piquero et al. 2003).

In view of the fact that most juvenile offenders mature out of crime (and that most will desist whether or not they are caught, arrested, prosecuted, or sanctioned), one must therefore ask how to best hold delinquent youth responsible for their actions and deter future crime (both their own and that of others) without adversely affecting their mental health, psychological development, and successful transition into adult roles. If the sanctions to which juvenile offenders are exposed create psychological disturbance, stunt the development of cognitive growth and psychosocial maturity, and interfere with the completion of schooling and entrance into the labor force, these policies are likely to exacerbate rather than ameliorate many of the very factors that lead juveniles to commit crimes in the first place (mental illness, difficulties in school or work, and, as reviewed above, psychological immaturity).

It is clear that sanctioning adolescents as adults is counterproductive. One group of researchers examining this question compared a group of 2700 Florida youths transferred to criminal court, mostly based on prosecutors' discretionary authority under Florida's direct-file statute, with a matched group of youths retained in the juvenile system (Bishop & Frazier 2000). In another study, the researchers compared 15- and 16-year-olds charged with robbery and burglary in several counties in metropolitan New York and in demographically similar counties in New Jersey. The legal settings differed in that New York juveniles age 15 and older who are charged with robbery and burglary are automatically dealt with in the adult system under that state's legislative waiver statute, whereas in New Jersey, transfer is rarely used, and the juvenile court retains jurisdiction over almost all youths charged with these crimes (Fagan 1996).

The New York-New Jersey study found that youths convicted of robbery in criminal court were rearrested and incarcerated at a higher rate than those who were dealt with in the juvenile system, but that rates were comparable for burglary, a less serious crime. The study also examined the number of days until rearrest and found a similar pattern; the youths sentenced for robbery in criminal court reoffended sooner than did their juvenile court counterparts. Recidivism was not affected by sentence length; longer sentences were not more

effective at reducing recidivism than were shorter sentences. Results of the Florida study also support the conclusion that juvenile sanctions may reduce recidivism more effectively than criminal punishment. This study measured only rearrest rates and found lower rates for youths who were retained in juvenile court than for youths who were transferred. The follow-up period in this study was relatively brief—less than two years. During this period, transferred youth were more likely to be rearrested, committed more offenses per year, and reoffended sooner than did juveniles in the juvenile system. As in the New York-New Jersey study, longer sentences did not have a deterrent effect.

Within the juvenile system, of course, there is wide variation in the types and severity of sanctions to which offenders are exposed. Some youths are incarcerated in prison-like training schools, whereas others receive loosely supervised community probation—neither of which is effective at changing antisocial behavior. An important question therefore is, what can the juvenile system offer young offenders that will be effective at reducing recidivism? A detailed discussion of the enormous literature evaluating the effects of various sanctions and interventions is beyond the scope of this review, and this literature has been summarized many times (Greenwood 2006, Lipsey 1999). Here I highlight a few main points.

Until the 1990s, most researchers who study juvenile delinquency programs might well have answered that the system had little to offer in the way of effective therapeutic interventions; the dominant view held by social scientists in the 1970s and 1980s was that "nothing works" to reduce recidivism with young offenders. Today the picture is considerably brighter, in large part due to a substantial body of research produced over the past 15 years showing that many juvenile programs, in both community and institutional settings, have a substantial crime-reduction effect; for the most promising programs, that effect is in the range of 20% to 30%. An increased focus on research-based programs and on careful outcome evaluation allows policy makers to assess accurately the impact on recidivism rates of particular programs to determine whether the economic costs are justified. In a real sense, these developments have revived rehabilitation as a realistic goal of juvenile justice interventions.

In general, successful programs are those that attend to the lessons of developmental psychology, seeking to provide young offenders with supportive social contexts and to assist them in acquiring the skills necessary to change problem behavior and to attain psychosocial maturity. In his comprehensive meta-analysis of 400 juvenile programs, Lipsey (1995) found that among the most effective programs in both community and institutional settings were those that focused on improving social development skills in the areas of interpersonal relations, self-control, academic performance, and job skills. Some effective programs focus directly on developing skills to avoid antisocial behavior, often through cognitive behavioral therapy. Other interventions that have been shown to have a positive effect on crime reduction focus on strengthening family support, including Multisystemic Therapy, Functional Family Therapy, and Multidimensional Treatment Foster Care, all of which are both effective and cost effective (Greenwood 2006). It is also clear from these reviews that punitive sanctions administered within the juvenile system have iatrogenic effects similar to those seen in studies of juveniles tried as adults. Punishment-oriented approaches, such as "Scared Straight" or military-style boot camps, do not deter future crime and may even inadvertently promote reoffending. Nor do these programs appear to deter other adolescents from offending (Greenwood 2006).

The dearth of evidence supporting the effectiveness of tough sanctions in deterring youthful criminal activity becomes less puzzling when we consider the response of young offenders to harsh punishment in light of developmental knowledge about adolescence discussed earlier. Teenagers on the street deciding whether to hold up a convenience store may simply be less capable than adults, due to their

psychosocial immaturity, of considering the sanctions they will face. Thus, the developmental influences on decision making that mitigate culpability also may make adolescents less responsive to the threat of criminal sanctions (Scott & Steinberg 2008).

In addition, adolescence is a formative period of development. In mid and late adolescence, individuals normally make substantial progress in acquiring and coordinating skills that are essential to filling the conventional roles of adulthood. First, they begin to develop basic educational and vocational skills to enable them to function in the workplace as productive members of society. Second, they also acquire the social skills necessary to establish stable intimate relationships and to cooperate in groups. Finally, they must begin to learn to behave responsibly without external supervision and to set meaningful personal goals for themselves. For most individuals, the process of completing these developmental tasks extends into early adulthood, but making substantial progress during the formative stage of adolescence is important. This process of development toward psychosocial maturity is one of reciprocal interaction between the individual and her social context. Several environmental conditions are particularly important, such as the presence of an authoritative parent or guardian, association with prosocial peers, and participation in educational, extracurricular, or employment activities that facilitate the development of autonomous decision making and critical thinking. For the youth in the justice system, the correctional setting becomes the environment for social development and may affect whether he acquires the skills necessary to function successfully in conventional adult roles (Steinberg et al. 2004).

Normative teenagers who get involved in crime do so, in part, because their choices are driven by developmental influences typical of adolescence. In theory, they should desist from criminal behavior and mature into reasonably responsible adults as they attain psychosocial maturity—and most do, especially as they enter into adult work and family responsibilities. Whether youths successfully make the transition to adulthood, however, depends in part on whether their social context provides opportunity structures for the completion of the developmental tasks described above. The correctional environment may influence the trajectories of normative adolescents in the justice system in important ways. Factors such as the availability (or lack) of good educational, skill building, and rehabilitative programs; the attitudes and roles of adult supervisors; and the identity and behavior of other offenders shape the social context of youths in both the adult and the juvenile systems. These factors may affect the inclination of young offenders to desist or persist in their criminal activities and may facilitate or impede their development into adults who can function adequately in society—in the workplace, in marriage or other intimate unions, and as citizens.

SUMMARY AND CONCLUDING COMMENTS

The overarching question I pose in this article is whether research on adolescent development indicates that adolescents and adults differ in ways that warrant their differential treatment when they violate the law. More specifically, I ask how this research informs debate about three fundamental questions that continue to challenge the justice system: (*a*) Should adolescents be held to adult standards of criminal culpability and, accordingly, exposed to the same punishment as adults; (*b*) Do adolescents possess the necessary capabilities to function as competent defendants in an adversarial court proceeding; and (*c*) How are juvenile offenders affected by the sorts of punitive sanctions that became increasingly popular during the past several decades?

It is now incontrovertible that psychological development continues throughout adolescence and into young adulthood in ways that are relevant to all three questions. Although basic cognitive competence matures by the time individuals reach age 16, many of the social and emotional capacities that influence adolescents'

judgment and decision making, especially outside the psychologist's laboratory, continue to mature into late adolescence and beyond. Compared to individuals in their mid to late twenties, adolescents even as old as 18 are more impulsive, less oriented to the future, and more susceptible to the influence of their peers. In addition, because adolescence is also period during which individuals are still acquiring the psychological capacities they will need to successfully transition into adult work and family roles, it is important that the sanctions to which juvenile offenders are exposed not adversely affect their development. Recent research on the neural underpinnings of these developments does not change the portrait of adolescent immaturity painted by behavioral research, but it does add detail and support to the argument that makes the story more compelling. It is one thing to say that adolescents don't control their impulses, stand up to peer pressure, or think through the consequences of their actions as well as adults; it is quite another to say that don't because they can't.

Because American criminal law clearly provides that diminished judgment mitigates criminal responsibility, it is reasonable to argue that adolescents are inherently less blameworthy than their elders in ways should affect decisions about criminal punishment; as a class, adolescents are inherently less blameworthy than adults. The picture that emerges from an analysis of the capacities necessary for competence to stand trial is not the same, however. Here the relevant research indicates that some adolescents (generally, those 16 and older) have adult-like capabilities but that others (generally those 15 and younger) may not. Research on the impact of punitive sanctions on adolescent development and behavior, although not explicitly developmental in nature, indicates that trying adolescents as adults or exposing them to especially harsh sanctions does little to deter offending and may indeed have iatrogenic effects.

Although justice system policy and practice cannot, and should not, be dictated solely by studies of adolescent development, the ways in which we respond to juvenile offending should at the very least be informed by the lessons of developmental science. Taken together, the lessons of developmental science offer strong support for the maintenance of a separate juvenile justice system in which adolescents are judged, tried, and sanctioned in developmentally appropriate ways. Using developmental science to inform juvenile justice policy is not a panacea that will solve the problem of youth crime. Adolescents will always get in trouble, sometimes very serious trouble, and some will continue to offend, despite the state's best efforts to respond to their crimes in ways that will deter future offending. At the same time, the future prospects of some youths will be harmed by a system that holds them to adult levels of accountability for their crimes under our transfer rules. No one policy regime will yield good outcomes for all young offenders, but looking to developmental research to guide our decision making provides a solid framework for policies and practices that will enhance public safety in the long run by promoting healthy adolescent development.

SUMMARY POINTS

1. During the past two decades, policies and practices concerning the treatment of juvenile offenders in the United States became increasingly punitive, as evidenced by the increase in the number of juveniles tried as adults and the expanded use of harsh sanctions within both the juvenile and criminal justice systems. This was a break from the traditional model of juvenile justice, which emphasized rehabilitation rather than punishment as its core purpose, that had prevailed for most of the twentieth century.

2. In order to make well-informed decisions about the treatment of juveniles who have entered the juvenile justice pipeline, therefore, policymakers, practitioners, and mental health professionals need to be familiar with the developmental changes that occur during childhood and adolescence in the capabilities and characteristics that are relevant to their competence to stand trial, their criminal culpability, and their likely response to treatment.
3. Brain maturation continues well into young adulthood, and although individuals, on average, perform at adult levels on tests of basic cognitive ability by the time they are 16, most do not attain adult-like levels of social and emotional maturity until very late in adolescence or early in adulthood. Compared to adults, adolescents are more susceptible to peer influence, less oriented to the future, more sensitive to short-term rewards, and more impulsive.
4. This research on adolescent brain, cognitive, and psychosocial development supports the view that adolescents are fundamentally different from adults in ways that warrant their differential treatment in the justice system. An analysis of factors that mitigate criminal responsibility under the law indicates that adolescents are inherently less culpable than are adults and should therefore be punished less severely. In addition, studies of competence to stand trial indicate that those who are under 16 are more likely to be incompetent than are adults, raising questions about the appropriateness of trying younger adolescents in criminal court.
5. Studies of the impact of punitive sanctions on adolescent development and behavior, including prosecuting and sanctioning adolescents as adults, indicate that they do not deter adolescents from breaking the law and may in fact increase recidivism. In contrast, family-based interventions have been shown to be both effective and cost effective.

DISCLOSURE STATEMENT

The author is not aware of any biases that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

Work on this review was supported by the John D. and Catherine T. MacArthur Foundation. I am grateful to Elizabeth Cauffman, Thomas Grisso, Elizabeth Scott, and Robert Schwartz for their permission to draw on our collaborative work in the preparation of this review.

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Discusses why adolescents, by virtue of developmental immaturity, are inherently less culpable than adults. Cited multiple times by U.S. Supreme Court in its decision to abolish juvenile death penalty.

Annual Review of
Clinical Psychology
Volume 5, 2009

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THE FALSE PROMISE OF ADOLESCENT BRAIN SCIENCE IN JUVENILE JUSTICE

*Terry A. Maroney**

Recent scientific findings about the developing teen brain have both captured public attention and begun to percolate through legal theory and practice. Indeed, many believe that developmental neuroscience contributed to the U.S. Supreme Court's elimination of the juvenile death penalty in Roper v. Simmons. *Post-*Roper, *scholars assert that the developmentally normal attributes of the teen brain counsel differential treatment of young offenders, and advocates increasingly make such arguments before the courts. The success of any theory, though, depends in large part on implementation, and challenges that emerge through implementation illuminate problematic aspects of the theory. This Article tests the legal impact of developmental neuroscience by analyzing cases in which juvenile defendants have attempted to put it into practice. It reveals that most such efforts fail. Doctrinal factors hamstring most claims—for example, that persons with immature brains are incapable of forming the requisite mens rea for serious crimes. Limitations intrinsic to the science itself—for example, individual variation—also hinder its relevance and impact. These factors both explain why developmental neuroscience has had minimal effects on juvenile justice in the courts and illustrate why it generally should. Moreover, direct reliance on neuroscience as the metric for juvenile justice policy may jeopardize equality and autonomy interests, and brain-based arguments too frequently risk inaccuracy and overstatement. The cases also strongly suggest that neuroscience does not materially shape legal decisionmakers' beliefs and values about youthful offenders but instead will be read through the lens of those beliefs and values.*

Developmental neuroscience nonetheless can play a small role in juvenile justice going forward. Legislatures and courts may regard that science

* Associate Professor, Vanderbilt University Law School. Thanks to Abigail Baird, Tamar Birckhead, Lisa Schultz Bressman, Emily Buss, B.J. Casey, Nita Farahany, Barbara Fedders, Anna Gabrielidis, Chris Guthrie, Beatriz Luna, Lia Monahon, Stephen J. Morse, Emily Murphy, Alistair Newbern, Erin O'Hara, Christopher Slobogin, Elizabeth Sowell, Kevin Stack, Laurence Steinberg, Christine Sun, Franklin Zimring, and participants in workshops at University College London Faculty of Laws and the Gruter Institute for Law and Behavioral Research. Britt Doolittle provided extraordinary research assistance. For additional research assistance I thank Faisal Delawalla, Cassie Malin, Georgia Sims, Christopher Weber, and the excellent librarians at Vanderbilt University Law School.

as one source among many upon which to draw when basing policy choices on assumptions about juveniles as a group. To go further is unwarranted and threatens to draw attention away from critical legal and environmental factors—good schools, strong families, economic opportunities, mental health care, humane sentencing regimes, and rehabilitative services—that are both more important and subject to greater direct control.

INTRODUCTION

This is the decade of the adolescent brain. Popular media sources claim that contemporary developmental neuroscience[1] shows "What Makes Teens Tick" and explains their "exasperating" behavior,

1 Developmental neuroscience, the teen-relevant portion of which also is referred to herein as "adolescent brain science," is the study of life-course changes in the brain's structure and function. Yuko Munakata et al., *Developmental Cognitive Neuroscience: Progress and Potential*, 8 TRENDS COGNITIVE SCI. 122, 122–23 & box 1 (2004) (using term "developmental cognitive neuroscience" instead). It interacts importantly with developmental psychology, "the scientific study of changes in physical, intellectual, emotional, and social development over the life cycle." Laurence Steinberg & Robert G. Schwartz, *Developmental Psychology Goes to Court*, *in* YOUTH ON TRIAL 9, 21 (Thomas Grisso & Robert G. Schwartz eds., 2000).

including criminal acts.[2] Allstate Insurance released a major national ad claiming that teens are "missing a part of their brain[s]" and therefore should gain driving privileges only gradually.[3] Parents can now choose among a number of self-help books offering brain-based explanations for why their adolescents are "primal" and "crazy."[4]

Far from being confined to popular culture, the fascination with adolescent brain science has begun actively to percolate through legal theory, advocacy, and lawmaking. Prominent academics argue that an understanding of the teen brain both supports retention of a separate juvenile justice system and illuminates the proper perspective on the adjudication and treatment of young offenders.[5] Crimes committed by still-developing young people, these scholars urge, are less blameworthy than equivalent acts by adults; further, youths' developmental plasticity makes them more likely to stop offending—if, that is, we provide them with conditions conducive to rehabilitation.[6] Juveniles' defense attorneys and policy advocates increasingly cite to such research, which they say puts "the juvenile back in juvenile justice."[7]

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2 Claudia Wallis, *What Makes Teens Tick?*, TIME, May 10, 2004, at 56; *see also* Jay D. Aronson, *Brain Imaging, Culpability and the Juvenile Death Penalty*, 13 PSYCHOL. PUB. POL'Y & L. 115, 115 (2007) ("Since the 1999 Columbine High School shootings, the shortcomings of the teen brain have captivated American society as an explanation for violent and other inappropriate adolescent behavior."); Sharon Begley, *Getting Inside a Teen Brain*, NEWSWEEK, Feb. 28, 2000, at 58 ("It turns out there's a good reason adolescent brains seem different: they are."); Joline Gutierrez Krueger, *Brain Science Offers Insight on Teen Crime*, ALBUQUERQUE TRIB., Dec. 8, 2006, at A1; Leslie Sabbagh, *The Teen Brain, Hard at Work, No, Really*, SCI. AM. MIND, Aug./Sept. 2006, at 20, 21–23 (presenting research suggesting that relative brain immaturity "may explain why adolescents exhibit impulsive or thoughtless behavior"); Paul Thompson, Editorial, *Brain Research Shows a Child Is Not an Adult*, FT. LAUDERDALE SUN-SENTINEL, May 25, 2001, at 31A (arguing that new evidence regarding teenage brain development compels different treatment of adolescents in the justice system).

3 Allstate Insurance Co. Advertisement (2007), *available at* http://www.allstate.com/content/refresh-attachments/Brain-Ad.pdf ("[When] bright, mature teenagers sometimes do things that are 'stupid' . . . it's not really their fault. It's because their brain hasn't finished developing.").

4 *See* MICHAEL J. BRADLEY, YES, YOUR TEEN IS CRAZY! (2002); LOUANN BRIZENDINE, THE FEMALE BRAIN 31–56 (2006) (containing chapter titled "The Teen Girl Brain"); BARBARA STRAUCH, THE PRIMAL TEEN (2003); DAVID WALSH, *WHY* DO THEY ACT THAT WAY? A SURVIVAL GUIDE TO THE ADOLESCENT BRAIN FOR YOU AND YOUR TEEN (2004).

5 *See, e.g.*, ELIZABETH S. SCOTT & LAURENCE STEINBERG, RETHINKING JUVENILE JUSTICE 28–60 (2008).

6 *See id.* at 13–16.

7 *Putting the Juvenile Back in Juvenile Justice*, JUV. JUST. ISSUE BRIEF (Action for Children N.C., Raleigh, N.C.), Dec. 2007, at 1, *available at* http://www.ncchild.org/action/images/stories/Juvenile_Justice_Raising_The_Age_Brief_final.pdf [hereinafter *Putting the Juvenile Back in Juvenile Justice*]; *see also* WIS. COUNCIL ON CHILDREN &

Prosecutors, too, recognize the potential relevance of neuroscience, though they are less sanguine about whether its necessary policy implications tend in the direction of greater solicitude.[8] More, courts and legislatures have begun to take note. United States Supreme Court Justice Stevens in 2002 signaled his interest in "[n]euroscientific evidence" which "has revealed that adolescent brains are not fully developed."[9] Senator Edward Kennedy in 2007 convened a hearing on the juvenile-justice implications of brain development.[10] Many scholars, attorneys, commentators, and courts believe that such science played a critical role in *Roper v. Simmons*,[11] in which the Supreme Court abol-

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FAMILIES, RETHINKING THE JUVENILE IN JUVENILE JUSTICE 4 (2006) [hereinafter RETHINKING THE JUVENILE]; Wendy Paget Henderson, *Life after* Roper*: Using Adolescent Brain Science in Court*, CHILDREN'S RIGHTS (Am. Bar Ass'n, Chicago, IL), Fall/Winter 2009, at 1 ("[A]ttorneys [are] . . . moving adolescent brain development front and center into the juvenile and criminal court.").

This Article uses the terms "juvenile advocates" and "advocates" to signify both defense attorneys and employees and affiliates of institutes that advocate for juveniles' interests.

8 *See, e.g.*, AM. PROSECUTORS RESEARCH INST., A PROSECUTOR'S GUIDE TO PSYCHOLOGICAL EVALUATIONS AND COMPETENCY CHALLENGES IN JUVENILE COURT 1, 18, 42–45 (2006) (presenting data with goal of disputing "sham mental defenses" and countering "disturbing" trend of using "expert testimony to excuse the dangerous and harmful behavior of youth"); *Two Training Opportunities*, IN RE EXPRESS (Nat'l Juvenile Justice Prosecution Ctr., Alexandria, Va.), Apr. 2004 (listing "Adolescent Brain" training program in Columbus, Ohio in May 2004); Course Schedule, National District Attorneys Association Education Division (Oct. 2007—Mar. 2008), *available at* http://www.ndaa.org/pdf/nac_course_schedule_oct_07_mar_08.pdf (stating, in listing for course on "The Adolescent Brain," that "participants will have a better understanding of adolescent brain development" enabling cross-examination of defense experts); *see also* Laurence Steinberg, *Should the Science of Adolescent Brain Development Inform Public Policy?*, 64 AM. PSYCHOLOGIST (forthcoming 2009) (manuscript at 5–9), *available at* http://www.temple.edu/psychology/lds/documents/adolescentbrainscienceandpublicpolicy.pdf (describing how in the case of Omar Khadr, a fifteen-year-old held at Guantánamo Bay, military prosecutor questioned defense expert about brain development in effort to show Khadr was fully responsible for alleged actions).

9 *In re* Stanford, 537 U.S. 968, 971 (2002) (Stevens, J., dissenting from denial of certiorari).

10 *Hearing on Adolescent Brain Development and Juvenile Justice Before the Subcomm. on Healthy Families and Communities of the S. Comm. on Education and Labor and the Subcomm. on Crime, Terrorism, and Homeland Security of the S. Comm. on the Judiciary*, 110th Cong. (2007) [hereinafter *Hearing on Adolescent Brain Development*].

11 543 U.S. 551 (2005); *see also, e.g.*, Walker v. Commonwealth, Nos. 2006-CA-001247-MR, 2006-CA-002074-MR, 2008 WL 1991612, at *2 (Ky. Ct. App. May 9, 2008) (stating that *Roper* Court discussed adolescent brain development); Ken Strutin, *Neurolaw: New Interdisciplinary Research Enters Legal System*, N.Y. L.J., Jan. 13, 2009, at 5 ("[T]he U.S. Supreme Court . . . concluded that juveniles did not merit the death penalty because, among other reasons, their brains were not as developed as adults.").

ished the juvenile death penalty.[12] Many now assert that brain science might, and should, play an even larger role going forward.

This Article argues that, contrary to the high expectations many have placed on developmental neuroscience, it will—and should—have fairly modest effects on juvenile justice. Not only is this correct as a matter of theory, it is being borne out in practice. To show how this is so, this Article offers the first attempt systematically to identify and analyze cases in which advocates have attempted to put developmental neuroscience into practice. The case analysis demonstrates that most such efforts fail, for two primary reasons: a disconnect between scientific findings and the questions asked by legal doctrine, and limitations posed by the science itself. Though the analysis reveals instances in which courts cite approvingly to brain-science arguments, in no such case does that science appear to have been outcome-determinative.

The relative inefficacy of brain science in influencing court outcomes illuminates significant theoretical and practical barriers to such influence. Those barriers counsel that that the trend toward urging reliance on such science be significantly moderated.

The Article proceeds as follows. Part I explains the ascendance of the teen brain within juvenile justice as a product of three streams' confluence: juvenile justice's close historical relationship with developmental psychology, a science that began a significant expansion in the 1980s; the radical growth of neuroscience, including developmental neuroscience, in the 1990s; and an emerging post-2000 dialogue between legal scholars and neuroscientists. Importantly, this confluence coincided with a widespread, sharp move away from traditional juvenile justice values,[13] as virtually every state in the 1990s began to treat far more juveniles as adults and to shrink the benefits—such as confidentiality—youth previously had enjoyed. Scholars and advocates began to see brain research as a tool to close an apparent disjuncture between science, which increasingly showed that juveniles

12 *Roper*, 543 U.S. at 569.

13 This Article uses the term "traditional juvenile justice values" to capture the primary features of the juvenile justice system in the period between *In re Gault*, 387 U.S. 1 (1967), and the mid-1990s. That period was characterized by the introduction of largely adult-like procedural safeguards (such as the right to counsel) and retention of core historical features such as confidentiality, record sealing, attention to individual characteristics and family circumstances, time-limited sanctions, and a focus on treatment and rehabilitation. *See* Emily Buss, *Rethinking the Connection Between Developmental Science and Juvenile Justice*, 76 U. CHI. L. REV. 493, 499–506 (2009) (reviewing SCOTT & STEINBERG, *supra* note 5) (offering similar definition of an "evolved" traditional model).

and adults are different, and law, which increasingly treated juveniles and adults as if they were the same. Efforts to abolish the juvenile death penalty reflected this new tactic. That the Supreme Court appeared to take cognizance of the science—and did, in fact, eliminate the death penalty—provided significant encouragement to that project.

Part II demonstrates that, despite projections, adolescent brain science has had, is likely to have, and should have only moderate impact in the courts. First, courts tend to regard even scientifically sound claims as legally irrelevant. For example, contemporary analysis of intentional mens rea asks only whether a defendant desired or knew that a result would obtain, while neuroscientific arguments invite a focus on substantive irrationality notwithstanding specific intent. Second, scientific limitations often hinder such claims. For example, because developmental neuroscience supports only probabilistic generalizations about youth as a class, it is unhelpful in making highly individualized determinations such as formation of intent. Direct reliance on neuroscience also has implications for equality and autonomy commitments, of which scholars and advocates have taken insufficient notice. Further, the pressures of advocacy incentivize defenders and advocates to downplay the legal-scientific mismatch or to overplay scientific findings (and incentivizes prosecutors and skeptics to do the opposite). Such distortions, not unique to the juvenile justice context but present in it, create a danger of poorly justified decisions.

Part III, however, argues that neuroscience nonetheless has a role—albeit a small one—to play in shaping juvenile justice policy. Neuroscience has more natural traction within juvenile justice than in adult criminal law. Rather than raising deep and likely unsolvable questions about human agency, it simply reinforces the (once) noncontroversial idea that, as a group, young people differ from adults in systematic ways directly relevant to their relative culpability, deterrability, and potential for rehabilitation. This message is well worth articulating; the cautionary point is that the theoretical and advocacy uses of adolescent brain science should mirror only the level of generality that the science can support. At this moment, that level of generality is fairly high. Similar lessons from the broader contemporary debate over the use of neuroscience in criminal law have not yet penetrated the dialogue within juvenile justice; this Article shows that they should. More, while neuroscientific evidence may be thought uniquely persuasive, this Article instead suggests that developmental neuroscience is legally persuasive only insofar as it aligns with decisionmakers' values, beliefs, and commitments.

The Article concludes that legal decisionmakers acting in a policymaking role—usually legislatures but sometimes the courts—therefore ought to consider developmental neuroscience one source among many upon which to draw when making legally relevant assumptions about adolescents as a group. To go further is unwarranted and unwise.

I. ADOLESCENT BRAIN SCIENCE AND JUVENILE JUSTICE: AN OVERVIEW

Adolescent brain science came to occupy its current prominence within juvenile justice because of the confluence of three distinct phenomena. Developmental psychology, always important within juvenile justice, became far more sophisticated; neuroscientific technology improved dramatically, facilitating ever more finely grained insights, including about youth; and scholars began a dialogue over the legal implications of neuroscience. By the early part of this century the confluence created the conditions for a close examination of the legal relevance of juvenile brain development. This Part traces this trajectory, describes the relevant findings of developmental neuroscience, shows how that science was invoked in *Roper*, and details the range of legal issues to which scholars now argue it to be relevant.

A. Developmental Psychology and Neuroscience

Theories of adolescence as a developmental stage importantly distinct from both childhood and adulthood always have been central to juvenile justice, underlying not only the core idea—that of having a separate system at all—but also the attributes of that system.[14] However, for most of the twentieth century developmental psychology was in a fairly primitive state and focused primarily on young children.[15]

14 *See* Gary B. Melton, *Developmental Psychology and the Law: The State of the Art*, 22 J. FAM. L. 445, 447–48 (1983–84) (discussing how juvenile courts are tasked with devising a developmentally appropriate approach to offending).

15 *See* Nicholas Hobbs & Sally Robinson, *Adolescent Development and Public Policy*, 37 AM. PSYCHOLOGIST 212, 213–16 (1982) (explaining how researchers believed that "by the adolescent years, it is too late to make any difference" in the cognitive development of young people). Several theorists did venture into adolescent development even during this early era. *See id.* at 217–18; ERIK H. ERIKSON, IDENTITY: YOUTH AND CRISIS 128–35 (1968); BÄRBEL INHELDER & JEAN PIAGET, THE GROWTH OF LOGICAL THINKING 344–50 (Anne Parsons & Stanley Milgram trans., 1958); Lawrence Kohlberg & Elliot Turiel, *Moral Development and Moral Education*, *in* SOCIAL INFLUENCES AND EDUCATIONAL PRACTICE (G. Lesser ed., 1971). These early theories occasionally were reflected in law. *See* Wisconsin v. Yoder, 406 U.S. 205, 245 n.3 (1972) (Douglas, J., dissenting in part) (citing JEAN PIAGET, THE MORAL JUDGMENT OF THE CHILD (1948)). *But see* Elizabeth S. Scott, Judgment and Reasoning in Adolescent Decisionmaking, 37

In the empirical void about teen development, courts, policymakers, and the public relied primarily on "common sense," or what they believed to be true based on experience and observation.[16] Common sense failed to provide a stable basis for delinquency policy: it is sufficiently elastic as to be consistent with competing theories, and the view it provides is myopic.[17] Beliefs about the causes of and cures for delinquent behavior therefore have vacillated wildly, carrying policy with them.[18]

It wasn't until the 1980s that a sustained program of relevant empiricism took hold.[19] Scientists began to study teens' risk-taking behaviors;[20] "sensation-seeking";[21] ability to adopt a future-time perspective;[22] perceptions of personal vulnerability;[23] attitudes toward

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VILL. L. REV. 1607, 1627 & n.72, 1632–33 (1992) (explaining that Piaget's theory of cognitive development is now largely discredited).

16 *See* Terry A. Maroney, *Emotional Common Sense as Constitutional Law*, 62 VAND. L. REV. 851, 859–68 (2009) (defining "common sense"); Kim Taylor-Thompson, *States of Mind/States of Development*, 14 STAN. L. & POL'Y REV. 143, 146 (2003) (describing the historical reliance on common sense in juvenile justice).

17 Experiences with youthful offending (and one's resulting common sense about it) vary across a population and over time. Further, a commonsense theory might be accurate as to some juveniles, in some circumstances, some of the time, but fail as a generalizable account. *Cf.* Maroney, *supra* note 16, at 877–902 (illustrating that decisions based on common sense are not always subject to categorization as empirically correct or incorrect, but often are best understood as indicators of a person's underlying worldview); Scott, *supra* note 15, at 1669 (explaining that the goal of research is to "replace intuition with insight"); Steinberg & Schwartz, *supra* note 1, at 22 (maintaining that "[c]ommon sense and casual observation" tell us that children and adults are different but cannot reliably indicate whether particular differences are "substantial and consistent enough to potentially shape either public policy or legal practice").

18 Like the delinquent in "Gee, Officer Krupke," juveniles have been shoved between competing theories. *See* ARTHUR LAURENTS ET AL., WEST SIDE STORY 114–18 (1958) (music by Leonard Bernstein and lyrics by Stephen Sondheim); *see also* Taylor-Thompson, *supra* note 16, at 172 (asserting that adolescents have sometimes been regarded as "wholly vulnerable and incompetent children in need of paternalistic strategies designed to guide their conduct," and sometimes as "fully calculating and sometimes sociopathic mini-adults deserving society's harshest punishment").

19 *See* Hobbs & Robinson, *supra* note 15, at 219–20; Melton, *supra* note 14, at 458.

20 *See* ADOLESCENT RISK TAKING (Nancy J. Bell & Robert W. Bell eds., 1993); Jeffrey Arnett, *Reckless Behavior in Adolescence: A Developmental Perspective*, 12 DEVELOPMENTAL REV. 339 (1992); Ruth Beyth-Marom et al., *Perceived Consequences of Risky Behaviors: Adults and Adolescents*, 29 DEVELOPMENTAL PSYCHOL. 549 (1993).

21 *See* Jeffrey Arnett, *Sensation Seeking: A New Conceptualization and a New Scale*, 16 PERSONALITY & INDIVIDUAL DIFFERENCES 289 (1994).

22 *See* A.L. Greene, *Future-Time Perspective in Adolescence: The Present of Things Future Revisited*, 15 J. YOUTH & ADOLESCENCE 99 (1986); Jari-Erik Nurmi, *How Do Adolescents See Their Future? A Review of the Development of Future Orientation and Planning*, 11 DEVELOPMENTAL REV. 1 (1991).

authority;[24] self-concept;[25] peer orientation;[26] and decisionmaking.[27] Research generally showed that teenagers are indeed distinct from both children and adults. For example, normal teens show a marked increase in risk-taking behavior, though they often display adult-level cognitive understanding of risk; they also display far higher levels of peer orientation and sensation-seeking.[28] Of particular importance for juvenile justice, research demonstrated that some level of delinquent behavior is normal, particularly for boys, and that the vast majority of teens "age out" of such offending.[29] Psychologists and legal scholars began in the 1980s a collaborative effort to define and measure teens' law-relevant psychological attributes, such as competence to waive *Miranda* rights or choose abortion.[30] Nevertheless, in the early 1990s juvenile justice policy was still largely being "devised in a context of empirical uncertainty,"[31] and scholars undertook a con-

23 *See* Marilyn Jacobs Quadrel et al., *Adolescent (In)vulnerability*, 48 AM. PSYCHOLOGIST 102 (1993).

24 *See* K. Rigby & E.E. Rump, *Attitudes Toward Parents and Institutional Authorities During Adolescence*, 109 J. PSYCHOL. 109 (1981).

25 *See* Susan Harter et al., *The Development of Multiple Role-Related Selves During Adolescence*, 9 DEVELOPMENTAL PSCYHOPATHOLOGY 835 (1997).

26 *See* B. Bradford Brown et al., *Parenting Practices and Peer Group Affiliation in Adolescence*, 64 CHILD DEV. 467 (1993); Delbert S. Elliott & Scott Menard, *Delinquent Friends and Delinquent Behavior: Temporal and Developmental Patterns*, *in* DELINQUENCY AND CRIME 28 (J. David Hawkins ed., 1996).

27 *See* Catherine Lewis, *How Adolescents Approach Decisions: Changes over Grades Seven to Twelve and Policy Implications*, 52 CHILD DEV. 538 (1981); Leon Mann et al., *Adolescent Decision-Making: The Development of Competence*, 12 J. ADOLESCENCE 265 (1989); Laurence Steinberg & Elizabeth Cauffman, *Maturity of Judgment in Adolescence: Psychosocial Factors in Adolescent Decision Making*, 20 L. & HUM. BEHAV. 249 (1996).

28 *See* SCOTT & STEINBERG, *supra* note 5, at 38–44; B.J. Casey et al., *The Adolescent Brain*, 1124 ANNALS N.Y. ACAD. SCI. 111, 112, 122 (2008) (describing how impulse control shows linear improvement with age, but risk-taking behavior increases then decreases over adolescence).

29 *See* FRANKLIN E. ZIMRING, AMERICAN JUVENILE JUSTICE 63, 91–103 (2005) ("The central notion of . . . 'adolescence-limited' offending is that the cure for youth crime is growing up."); Terrie E. Moffitt, *Adolescence-Limited and Life-Course-Persistent Antisocial Behavior: A Developmental Taxonomy*, 100 PSYCHOL. REV. 674, 675–79 (1993); Edward P. Mulvey & Mark Aber, *Growing out of Delinquency: Development and Desistance*, *in* THE ABANDONMENT OF DELINQUENT BEHAVIOR 99, 100–01 (Richard L. Jenkins & Waln K. Brown eds., 1988).

30 *See, e.g.*, Melton, *supra* note 14, at 448, 463 & n.87 (discussing how "the overriding contemporary issue in the law affecting children is the limits of their competence," which has seen "the most rapid growth in recent research"); Elizabeth S. Scott et al., *Evaluating Adolescent Decision Making in Legal Contexts*, 19 L. & HUM. BEHAV. 221, 221–23 (1995); Scott, *supra* note 15, at 1623, 1627–28 & nn.60, 67 ("Much of the analysis of adolescent competence has focused on medical decisionmaking.").

31 Scott, *supra* note 15, at 1663.

certed effort to close that gap.[32] By the late 1990s a respectable body of research was in place, more research was underway, and advocates increasingly cited to such research.[33]

At precisely this same time, a veritable revolution was taking place in neuroscience. Technological breakthroughs allowed for increasingly sophisticated observation of human brains *in vivo*, including those of young people,[34] a development that quickly drew widespread attention.[35]

Widely publicized structural imaging studies demonstrated in 1999 that the brains of normal adolescents are still developing.[36] Such findings, later replicated, challenged an ingrained scientific belief that such maturation was largely complete in early childhood.[37] Adolescent structural maturation, these studies showed, appeared to revolve around two processes: myelination, or insulation of neural axons with a fatty substance referred to as "white matter," and changes

32 *See* Thomas Grisso & Robert G. Schwartz, *Introduction* to YOUTH ON TRIAL, *supra* note 1, at 1, 3–5 (explaining how the MacArthur Foundation Research Network on Adolescent Development and Juvenile Justice was founded in 1995 to respond to "society's need for a scientific initiative that would address the implications of adolescent development for the construction of rational juvenile justice policy and law").

33 *See generally* YOUTH ON TRIAL, *supra* note 1, at 67–265 (presenting a series of articles showing the relevance of developmental research to juvenile justice); Donald L. Beschle, *The Juvenile Justice Counterrevolution: Responding to Cognitive Dissonance in the Law's View of the Decision-Making Capacity of Minors*, 48 EMORY L.J. 65, 95–100 (1999) (joining developmental and legal research in juvenile-justice context); Richard E. Redding, *Juveniles Transferred to Criminal Court: Legal Reform Proposals Based on Social Science Research*, 1997 UTAH L. REV. 709, 723–33 (same, in context of trying juveniles as adults).

34 *See* L.P. Spear, *Adolescent Brain Development and Animal Models*, 1021 ANNALS N.Y. ACAD. SCI. 23, 23–24 & fig. 1 (2004). For a review of such studies, see generally Casey et al., *supra* note 28, at 113.

35 *See, e.g.*, Tim Jarvis, *The Brain Age*, O OPRAH MAG., Nov. 2008, at 169, 170, 174; Jeffrey Rosen, *The Brain on the Stand*, N.Y. TIMES MAG., Mar. 11, 2007, at 49, 50–53.

36 *See* Jay N. Giedd et al., *Brain Development During Childhood and Adolescence: A Longitudinal MRI Study*, 2 NATURE NEUROSCIENCE 861, 861–62 (1999); Tomás Paus et al., *Structural Maturation of Neural Pathways in Children and Adolescents: In Vivo Study*, 283 SCIENCE 1908, 1908 (1999); Elizabeth Sowell et al., In Vivo *Evidence for Post-Adolescent Brain Maturation in Frontal and Striatal Regions*, 2 NATURE NEUROSCIENCE 859, 860–61 (1999). Explanations of the technology behind structural and functional brain imaging are legion. *See, e.g.*, B.J. Casey et al., *Imaging the Developing Brain: What Have We Learned About Cognitive Development?*, 9 TRENDS COGNITIVE SCI. 104, 104–105 & box 1 (2005); Teneille R. Brown & Emily R. Murphy, *Through a Scanner Darkly—Functional Neuroimaging as Evidence of a Criminal Defendant's Past Mental States*, 62 STAN. L. REV. (forthcoming 2010) (manuscript at 15–31, on file with author).

37 *See* Aronson, *supra* note 2, at 119 ("For most of the 20th century, experts believed that the most important period for human brain development was the first 3 years of a person's life.").

in the volume and density of "gray matter," or neuron cell bodies and synapses.[38] Healthy brains showed linear increases in white matter from childhood until adulthood, indicating a progressive increase in potential for fast, efficient communication among brain systems.[39] Scientists also identified "a preadolescent increase followed by a postadolescent decrease" in gray matter,[40] showing that the early adolescent brain experiences an overproduction of neurons similar to one previously observed in very early childhood. Following this second wave of "exuberance," neural connections are over the course of adolescence sharply "pruned back"—likely because of relative use, dependent on life experiences, and reflecting a "fine tuning" of ability.[41] Further, both pruning and myelination were shown to affect different regions of the brain at different times; the brain's evolutionarily new frontal cortices are the last fully to achieve structural maturity.[42] This finding was particularly meaningful, as the frontal cortices are responsible for higher-order reasoning and "executive control"—fluid coordination of cognition and emotion, goal-directed planning and forethought, and impulse control.[43] A small number of functional imaging studies additionally suggested that adolescents might tend to

38 *See* Giedd et al., *supra* note 36, at 861–62; Sowell et al., *supra* note 36, at 860; *see also* Charles A. Nelson III et al., *Neural Bases of Cognitive Development*, *in* CHILD & ADOLESCENT DEVELOPMENT 19, 24–25 (William Damon & Richard M. Lerner eds., 2008) (describing the processes of synaptic pruning and myelination).

39 *See* Giedd et al., *supra* note 36, at 861; Paus et al., *supra* note 36, at 1908–09; *see also* Abigail A. Baird, *The Developmental Neuroscience of Criminal Behavior*, *in* THE IMPACT OF BEHAVIORAL SCIENCES ON CRIMINAL LAW 81, 99 (Nita A. Farahany ed., 2009) ("It [is] well established that myelination has a direct impact on the speed and efficiency of neural processing."). The developmental tradeoff is that the brain "is probably losing some of its raw potential for learning and its ability to recover from trauma." Wallis, *supra* note 2, at 59.

40 *See* Giedd et al., *supra* note 36, at 861; *see also* Sowell et al., *supra* note 36, at 860 (summarizing experimental observations of reductions in grey matter between adolescence and adulthood).

41 *See* B.J. Casey et al., *Structural and Functional Brain Development and Its Relation to Cognitive Development*, 54 BIOL. PSYCHOL. 241, 243 (2000); *see also* STRAUCH, *supra* note 4, at 9, 15 (defining "exuberance"); Giedd et al., *supra* note 36, at 863 ("[S]econd wave of overproduction of synapses . . . may herald a critical stage of development when the environment or activities of the teenager may guide selective synapse elimination during adolescence."); L.P. Spear, *The Adolescent Brain and Age-Related Behavioral Manifestations*, 24 NEUROSCIENCE & BIOBEHAVIORAL REVS. 417, 439 (2000) (explaining how the brain is "sculpted on the basis of experience to effectively accommodate environmental needs").

42 *See* Giedd et al., *supra* note 36, at 861–62; *see also* Nitin Gogtay et al., *Dynamic Mapping of Human Cortical Development During Childhood Through Early Adulthood*, 101 PROC. NAT'L ACAD. SCI. 8174, 8174 (2004) (finding back-to-front pattern).

43 MICHAEL S. GAZZANIGA ET AL., COGNITIVE NEUROSCIENCE 75 (2d ed. 2002).

employ different brain processes than adults when carrying out identical tasks.[44]

Thus, by the early 2000s neuroscience supported the notion that teen brains are structurally and functionally different from those of both children and adults. A developmentally normal combination of pruning and myelination results eventually in a brain that is better equipped quickly and efficiently to respond appropriately to life's challenges and perform the types of tasks for which the person has trained. While the average normal adolescent's physical capacity for such maturity far exceeds that of a child, it falls short of that of the average normal adult. As developmental psychology by that time strongly indicated that "many of the[ ] aptitudes" known to be associated with the implicated brain areas "continue to develop between adolescence and young adulthood,"[45] a behavioral link appeared logical. It therefore was possible to link the two streams of research and to hypothesize that to "the extent that transformations occurring in adolescent brain contribute to the characteristic behavioral predispositions of adolescence, adolescent behavior is in part biologically determined."[46]

This narrative, joining together the complimentary implications of behavioral studies and direct brain observation, emerged against the backdrop of a larger dialogue then taking shape over the implications of neuroscience for law.[47] Scholars predicted that emerging brain science would be particularly relevant to criminal law, given the

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44 *See, e.g.*, Abigail A. Baird et al., *Functional Magnetic Resonance Imaging of Facial Affect Recognition in Children and Adolescents*, 38 J. AM. ACAD. CHILD & ADOLESCENT PSYCHIATRY 195, 198–99 (1999).

45 Sowell et al., *supra* note 36, at 860 (stating that teens lack structural maturity in brain areas "essential for such functions as response inhibition, emotional regulation, planning and organization").

46 Spear, *supra* note 41, at 447.

47 A survey of the rapidly expanding literature on law and neuroscience is beyond the scope of this Article. *See generally* LAW AND THE BRAIN (Semir Zeki & Oliver Goodenough eds., 2006) (collecting works on neuroscience's influence in law); NEUROSCIENCE AND THE LAW (Brent Garland ed., 2004) (projecting developments to which neuroscience might lead and examining how the law might affect, and be affected by, them); Baird, *supra* note 39, at 89–100 (asserting that brain maturation supports the coordination of emotional and cognitive capacities, facilitating behavioral conformance to socially mandated standards); Scott T. Grafton et al., *Brain Scans Go Legal*, SCI. AM. MIND, Dec.2006/Jan. 2007, at 30 (discussing the impact of neuroimaging on assessments of criminal responsibility); Symposium, *Brain Imaging and the Law*, 33 AM. J. L. & MED. 163 (2007) (presenting nine articles on neurotechnology and law); Law and Neuroscience Project, http://www.lawandneurosciencesproject.org/ (last visited Oct. 30, 2009) (describing the MacArthur Foundation funded national research project).

centrality of mental states to criminal responsibility.[48] The most aggressive claim was that neuroscience would upend entrenched concepts of free will and responsibility underlying all criminal law.[49] A more modest prediction was that neuroscience might improve identification and understanding of the types of irrationality already relevant to criminal law.[50] For instance, better understanding of the effects of brain damage might help demonstrate that a defendant is adjudicatively incompetent.[51] Particularly because juvenile justice—far more than the adult criminal system—explicitly invites insights from the mind sciences, this particular brain-law connection appeared especially promising to both scholars and advocates.

It also appeared to be much needed. Completely separately from the development taking place in psychology and neuroscience, the law of juvenile justice began in the 1990s to undergo a convulsive change of its own. Prompted by what appeared to be a spike in gun-related youth homicides, commentators and policymakers warned of a new breed of juvenile "superpredators" who would be responsible for a "coming bloodbath" of youth crime.[52] States responded with an impressive amount of juvenile justice legislation in an extremely short

48 *See* Semir Zeki & Oliver R. Goodenough, *Introduction* to LAW AND THE BRAIN, *supra* note 47, at xi, xiii–xiv.

49 *See* Joshua Greene & Jonathan Cohen, *For the Law, Neuroscience Changes Nothing and Everything*, *in* LAW AND THE BRAIN, *supra* note 47, at 207, 224 (detailing and debunking most such claims but arguing nonetheless that neuroscience will dispel "illusion" of free will and cause retributive theories to "give way to consequentialist ones, thus radically transforming our approach to criminal justice"). Scholarship seeking to moderate the strongest claims, *see, e.g.*, Amanda C. Pustilnik, *Violence on the Brain: A Critique of Neuroscience in Criminal Law*, 44 WAKE FOREST L. REV. 183 (2009), far outnumbers scholarship actually making those claims.

50 Stephen J. Morse, *New Neuroscience, Old Problems*, *in* NEUROSCIENCE AND THE LAW, *supra* note 47, at 157, 181, 186–87 ("[N]euroscience will surely discover much more about the types of conditions that can compromise rationality [under current legal standards and] may help adjudicate excusing and mitigating claims more accurately.").

51 *See generally* Terry A. Maroney, *Emotional Competence, "Rational Understanding," and the Criminal Defendant*, 43 AM. CRIM. L. REV. 1375, 1381–82 (2006) (discussing the concept of adjudicative competence and exploring the impact of brain damage); *cf.* Anemona Hartocollis, *In Support of Sex Attacker's Insanity Plea, a Look at His Brain*, N.Y. TIMES, May 11, 2007, at B3 (describing how Peter Braunstein introduced neuroscientific evidence of brain damage in a rape and kidnapping trial in an unsuccessful effort to demonstrate that mental illness prevented formation of mens rea).

52 *See Hearings on the Juvenile Justice and Delinquency Prevention Act: Hearing Before the Subcomm. On Early Childhood, Youth, and Families of the S. Comm. on Economic and Educational Opportunities*, 104th Cong., 90 (1996) (statement of Rep. Bill McCollum, Chairman, House Judiciary Comm.) ("Brace yourself for the coming generation of 'superpredators.'"); Peter Annin, *'Superpredators' Arrive: Should We Cage the New Breed of*

period of time—indeed, during the 1990s nearly every state amended its juvenile code.[53] States made it far easier to transfer ever-younger children to adult court for an ever-growing list of offenses, eroded confidentiality protections, and de-emphasized rehabilitation.[54] Hindsight shows that the "coming bloodbath" never materialized; the youth homicide spike fell off quickly, and juvenile crime has been at historic lows for some time.[55] The deep systemic changes enacted in response to those fears, though, remain largely in place. In important respects, the juvenile system became indistinguishable from the adult one, and the benefits it retained became available to fewer young persons.[56]

Vicious Kids?, NEWSWEEK, Jan. 22, 1996, at 57; John J. Dilulio, Jr., *The Coming of the Super-Predators*, WKLY. STANDARD, Nov. 27, 1995, at 23.

53 *See* Patricia Torbet & Linda Szymanski, *State Legislative Responses to Violent Juvenile Crime: 1996–1997 Update*, JUV. JUST. BULL. (Office of Juvenile Justice & Delinquency Prevention, U.S. Dep't of Justice, Washington, D.C.), Nov. 1998, at 1 (summarizing state legislative action reforming juvenile law in the areas of "jurisdictional authority," "judicial disposition," "sentencing authority," "corrections programming," "confidentiality," and "juvenile crime victims"), *available at* http://www.ncjrs.gov/pdffiles/172835.pdf; *see also, e.g.*, COLO. REV. STAT. § 19-2-102 (2008) (created by 1996 Colo. Sess. Laws 1595, as amended by 1999 Colo. Sess. Laws 68) (establishing "a system of juvenile justice" to "protect, restore, and improve public safety" and that "will appropriately sanction juveniles who violate the law"); Juvenile Corrections Act, 1995 Idaho Sess. Laws 65 (codified as amended in scattered sections of IDAHO CODE ANN. §§ 20-501 (2006)) (establishing a juvenile corrections system based on community protection and juvenile accountability); ZIMRING, *supra* note 29, at 105–06 (noting this trend).

54 *See Hearing on Adolescent Brain Development and Juvenile Justice*, *supra* note 10, at 4–5 (testimony of Michael A. Corriero) (characterizing states' legislative changes as "a collective regression that resulted in discarding or ignoring ancient assumptions, conventional wisdom, and conscientious research").

55 *See* HOWARD N. SNYDER & MELISSA SICKMUND, NAT'L CTR. FOR JUVENILE JUSTICE, JUVENILE OFFENDERS AND VICTIMS, at iii (2006), *available at* http://ojjdp.ncjrs.org/ojstatbb/nr2006 ("[T]he rate of juvenile violent crime arrests has consistently decreased since 1994, falling to a level not seen since at least the 1970s."); ZIMRING, *supra* note 29, at 120–22 (noting that youth crime rates already were dropping at the time the predictions were being made).

56 *See In re* L.M., 186 P.3d 164, 170 (Kan. 2008) (extending jury right to juvenile court because it has become so similar to adult court). Children as young as eleven now have been tried as adults, *see* People v. Abraham, 662 N.W.2d 836, 849 (Mich. Ct. App. 2003), and thousands who committed serious crimes as minors are serving sentences of life without parole, *see* HUMAN RIGHTS WATCH & AMNESTY INT'L, THE REST OF THEIR LIVES 25–31 (2005) (reporting that, as of 2004, 2225 youth offenders were serving life without parole and noting a sharp rise in such cases since the 1980s). Some scholars attribute this trend in part to *In re Gault*, 387 U.S. 1 (1967), on the theory that importation of adult procedures into juvenile court paved the way for treating juveniles like adults more generally. *See, e.g.*, Barry C. Feld, *Abolish the Juvenile*

Scholars and advocates in the late 1990s therefore correctly perceived that science and law were moving in precisely opposite directions: the former was solidifying around the view that adolescents are different from adults in ways directly relevant to their culpability and capacity for change, while the latter was solidifying around the view that adolescents, particularly older ones or those accused of very serious crimes, ought to be treated like adults.[57]

B. The Brain-Based Challenge to the Juvenile Death Penalty[58]

Scholars and juvenile advocates soon saw an opportunity to use brain science to break the tension and move law in their preferred direction: a challenge to the juvenile death penalty. This challenge provided a critical testing ground.[59]

Though the Supreme Court had in *Stanford v. Kentucky*[60] upheld the constitutionality of the death penalty for sixteen- and seventeen-year-olds,[61] states remained free to eliminate it. In 2000 a coalition of advocates began a state-by-state effort to convince them to do so, and made a strategic decision to rely heavily on recent findings in developmental psychology and neuroscience.[62] Researchers increasingly incorporated testimony about the teen brain into legislative testi-

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Court: Youthfulness, Criminal Responsibility, and Sentencing Policy, 88 J. CRIM. L. & CRIMINOLOGY 68, 69–70, 72–74 (1997).

57 *See, e.g.*, RETHINKING THE JUVENILE, *supra* note 7, at 4 (contrasting presumptions underlying legislative changes of the 1990s with implications of "new information about adolescent brain development").

58 This Article does not seek to replicate others' extensive accounts of *Roper v. Simmons*, 543 U.S. 551 (2005). *See, e.g.*, Aronson, *supra* note 2, at 123–37; Deborah W. Denno, *The Scientific Shortcomings of* Roper v. Simmons, 3 OHIO ST. J. CRIM. L. 379 (2006); Elizabeth F. Emens, *Aggravating Youth:* Roper v. Simmons *and Age Discrimination*, 2005 SUP. CT. REV. 51 (2006); Aliya Haider, Roper v. Simmons*: The Role of the Science Brief*, 3 OHIO ST. J. CRIM. L. 369 (2006).

59 Stephen J. Morse, *Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note*, 3 OHIO ST. J. CRIM. L. 397, 408 (2006) ("*Roper* has been the most important case to propose use of the new neuroscience to affect responsibility questions generally.").

60 492 U.S. 361 (1989).

61 *Id.* at 378 (permitting states to execute those 16 and older at the time of their crimes). *But see* Thompson v. Oklahoma, 487 U.S. 815, 836–37 (1988) (plurality opinion) (holding the death penalty unconstitutional for those 15 and under at time of crime).

62 *See* Patrick Boyle, *Behind the Death Penalty Ban*, YOUTH TODAY, Apr. 2005, at 1 (noting that the advocates sought to get "the scientific/medical community talking with the child advocacy community" (internal quotation marks omitted)).

mony, even bringing along plastic brain models to illustrate their points.[63]

A series of unexpected events quickly upped the ante. In June 2002 the Supreme Court in *Atkins v. Virginia*[64] reversed course on the constitutionality of executing mentally retarded persons.[65] In so doing it overturned a case[66] decided the same day as *Stanford*; further, the *Atkins* Court discussed relevant characteristics of the mentally retarded—for example, their relative deficiencies in controlling impulses—in a manner strongly paralleling arguments then being crafted as to adolescents. More, while *Atkins* was pending, Kevin Stanford—of *Stanford*—filed a petition for a writ of habeas corpus, relying in part on developmental neuroscience.[67] The Court denied the petition but four Justices dissented.[68] Importantly, Justice Stevens explicitly endorsed Stanford's scientific arguments:

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63 *See* Aronson, *supra* note 2, at 128 (stating that legislators were sometimes convinced to see the issue as "'not just a matter of law and morality, but [one] of adolescent development'" (quoting Mark Moran, *Adolescent Brain Development Argues Against Teen Executions*, PSYCHIATRIC NEWS, May 16, 2003, at 8 (2003)); Mary Beckman, *Crime, Culpability and the Adolescent Brain*, 305 SCIENCE 596, 596 (2004) ("The latest states [to ban the juvenile death penalty], Wyoming and South Dakota, considered brain development research in their decisions."); Boyle, *supra* note 62 (stating that such presentations, being given as early as the 1980s, gained momentum after 2000).

64 536 U.S. 304, 314–16 (2002).

65 *Id.* at 314–16.

66 Penry v. Lynaugh, 492 U.S. 302, 340 (1989) (upholding constitutionality of executing mentally retarded persons).

67 *See* Original Petition for Writ of Habeas Corpus, *In re* Stanford, No. 01-10009 (U.S. Oct. 21, 2002); Supplemental Brief in Support of Original Petition for Writ of Habeas Corpus, *Stanford*, No. 01-10009 (U.S. Oct. 21, 2002).

68 *See In re* Stanford, 537 U.S. 968 (2002) (Stevens, J., dissenting from denial of petition for writ of habeas corpus). The Governor of Kentucky in December 2003 commuted Stanford's sentence to life without parole. Stanford v. Commonwealth, 248 S.W.3d 579, 580 (Ky. Ct. App. 2007) (denying new sentencing hearing after commutation of sentence); VICTOR L. STREIB, THE JUVENILE DEATH PENALTY TODAY 6 (2005), *available at* http://www.law.onu.edu/faculty_staff/faculty_profiles/course-materials/streib/juvdeath.pdf.

Napoleon Beazley and Toronto Patterson, also on death row for crimes committed as juveniles, filed similar petitions in this same time period. Unlike Stanford, they faced imminent execution. Neither appears to have brought brain science to the Court's attention, though Patterson had done so before the state courts. *See* Declaration of Dr. Ruben C. Gur, Ph.D., Patterson v. Texas, 536 U.S. 984 (2002) (No. 02-6010) [hereinafter Gur, *Patterson* Declaration], *available at* http://www.abanet.org/crimjust/juvjus/Gur%20affidavit.pdf. Three Justices dissented from denial of his petition, saying the time had come to reconsider *Stanford*. Patterson, 536 U.S. at 984 (Stevens, J., dissenting from denial of stay of execution); *see also* Beazley v. Texas, 535 U.S. 1091 (2002) (denying Beazley's petition for writ of certiorari); *In re* Beazley, 535 U.S. 1094 (2002) (denying Beazley's request for a stay of execution). Beazley and

> Neuroscientific evidence of the last few years has revealed that adolescent brains are not fully developed, which often leads to erratic behaviors and thought processes in that age group. Scientific advances such as the use of functional magnetic resonance imaging—MRI scans—have provided valuable data that serve to make the case even stronger that adolescents "are more vulnerable, more impulsive, and less self-disciplined than adults."[69]

The post-*Atkins* moment fed a groundswell of attention to the teen brain from advocates, commentators, and the media.[70] Indeed, in late 2003 defense counsel for Lee Malvo—the teenager convicted of participating in the Washington, D.C. area "sniper slayings" while under the influence of an adult he regarded as his father—invoked

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Patterson were executed. *See* Death Penalty Information Center, Executions in the U.S. 1608–2002, http://www.deathpenaltyinfo.org/ESPYyear.pdf (last visited Oct. 30, 2009) (listing execution dates of May 28, 2002 for Beazley, and Aug. 28, 2002, for Patterson). Scott Allen Hain relied in part on developmental neuroscience in a similar petition; it was denied and he too was executed. *See* Petition for a Writ of Certiorari at 18–22, Hain v. Mullin, 537 U.S. 1173 (2003) (No. 02-6438); *see also Hain*, 537 U.S. at 1173 (2003) (denying petition for writ of certiorari); Death Penalty Information Center, Searchable Execution Database, http://www.deathpenaltyinfo.org/executions (search in field "Search by Name" for "Scott Allen Hain") (last visited Oct. 30, 2009) (listing execution date of Apr. 3, 2003 for Hain). Finally, Ron Chris Foster made a similar application. *See* Petition for Writ of Certiorari at 19–25, Foster v. Epps, 537 U.S. 1054 (2003) (No. 02-6655); *see also Foster*, 537 U.S. at 1054 (denying petition for writ of certiorari). As he was still alive when *Roper* was decided (because of a pending *Atkins* claim) he was resentenced to life without parole. *See* Foster v. State, 961 So. 2d 670, 672 (Miss. 2007).

69 *Stanford*, 537 U.S. at 971 (Stevens, J., dissenting from denial of petition for writ of habeas corpus) (quoting Stanford v. Kentucky, 492 U.S. 361, 395 (1989) (Brennan, J., dissenting)).

70 *See, e.g.*, Jeffrey Fagan, Atkins, *Adolescence and the Maturity Heuristic: Rationales for the Categorical Exemption For Juveniles from Capital Punishment*, 33 N.M. L. REV. 207, 207–10 (2003); Barry C. Feld, *Competence, Culpability, and Punishment: Implications of* Atkins *for Executing and Sentencing Adolescents*, 32 HOFSTRA L. REV. 463 (2003); Morse, *supra* note 59, at 408 ("Editorial pages encouraged the High Court to consider the neuroscientific evidence . . . ."); Elizabeth S. Scott & Laurence Steinberg, *Blaming Youth*, 81 TEX. L. REV. 799, 811–29 (2003); Laurence Steinberg & Elizabeth S. Scott, *Less Guilty by Reason of Adolescence: Developmental Immaturity, Diminished Responsibility, and the Juvenile Death Penalty*, 58 AM. PSYCHOL. 1009, 1009–10 (2003); Adam Ortiz, *Adolescence, Brain Development, and Legal Culpability*, JUV. JUST. CENTER (Am. Bar Ass'n, Washington, D.C.), Jan. 2004, at 1, 3 (arguing that brain research demonstrates "adolescents are less morally culpable for their actions than competent adults and are more capable of change and rehabilitation"); Sarah Spinks, *Adolescent Brains Are Works in Progress*, PBS, Jan. 2002, http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/work/adolescent.html.

incomplete brain development as a reason jurors should spare Malvo's life.[71]

In August of 2003 the Missouri Supreme Court defied *Stanford* and ruled the juvenile death penalty unconstitutional.[72] Certiorari was granted in *Roper v. Simmons* in January 2004.[73]

Christopher Simmons's lawyers chose prominently to highlight adolescent brain science in their briefs, arguing that "the parts of the brain that enable impulse control and reasoned judgment," as well as "competent decision-making, control of emotions, and moral judgment," are "not yet fully developed in 16- and 17-year-olds," deficits rendering them less culpable, less deterrable, and less than the "'fully

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71 *See* Robert E. Shepherd, Jr., Malvo *Closing Argument*, CRIM. JUST. MAG., Spring 2004, at 73, 74 (providing a partial transcript of defense counsel's closing argument). The defense called as a mitigation expert Dr. Evan Nelson, a forensic psychologist involved in *Atkins*, *see* CHARLES PATRICK EWING & JOSEPH T. MCCANN, MINDS ON TRIAL 219–22 (2006), to testify about teen brain research. The defense's closing argument, which some jurors later credited with their decision to spare Malvo the death penalty, included the following:

> Intelligence does not equate to judgment. Intelligence does not equate to maturity. . . . You may have seen it on the front cover of Newsweek a year or so ago. It had a picture of the juvenile brain. It's called brain imaging. It's hard science. That shows that the juvenile brain is different. . . . [T]he frontal lobe of the juvenile brain is not developed. It's the CEO of the brain . . . . It is the portion of the brain that gives us our judgment, and it doesn't fully develop until we're into our early 20s . . . . [A]nd that's why we, as a society, have chosen not to grant full responsibilities . . . to teenagers.

Shepherd, *supra*, at 74.

72 State *ex rel.* Simmons v. Roper, 112 S.W.3d 397, 413 (Mo. 2003). Simmons had presented developmental neuroscience evidence before the Missouri Supreme Court. *See* Petitioner's Statement, Brief, and Argument at 50–54, *Simmons*, 112 S.W.3d 397 (No. 84454), 2003 WL 24219767. The court did not consider this evidence. *See Simmons*, 112 S.W.3d at 412 ("While the parties have cited this Court to numerous current studies and scientific articles about the structure of the human mind, the continuing growth of those portions of the mind that control maturity and decision-making during adolescence and young adulthood, and the lesser ability of teenagers to reason, this Court need not look so far afield.").

73 Roper v. Simmons, 540 U.S. 1160 (2004). While *Roper* was pending New Hampshire held hearings on a bill to abolish the juvenile death penalty. Two researchers testified about developmental neuroscience. *See, e.g.*, *Hearing on SB 513 Relative to the Death Penalty Before S. Comm. On Judiciary*, 2004 Sess. (N.H. 2004) [hereinafter *Hearing on SB 513*] (testimony of David Fassler, M.D.).

Once certiorari was granted in *Roper*, a Delaware juvenile moved to preclude the state from seeking the death penalty. *See* State v. Jones, No. 9911016309, 2004 WL 2190097 (Del. Super. Ct. Aug. 31, 2004), *reh'g denied*, No. 9911016309, 2005 WL 950122 (Del. Super. Ct. Apr. 10, 2005). The court offered to stay proceedings; the defense asked to proceed. Jones was sentenced to death, a sentence set aside after *Roper*. *See infra* note 230.

rational, choosing agent[s]' presupposed by the death penalty."[74] Simmons's counsel similarly emphasized neuroscience in oral argument, devoting to it more time than any other issue.[75] This focus was complemented by a number of amicus parties, notably the American Medical Association, whose brief urged that "[a]dolescents' behavioral immaturity mirrors the anatomical immaturity of their brains."[76]

The *Roper* Court, in a decision closely tracking many of Simmons's arguments about maturity, agreed that the behavioral attributes of older adolescents were importantly parallel to evidence found dispositive in *Atkins*.[77] In the most frequently cited portion of the opinion, it noted "[t]hree general differences between juveniles under 18 and adults": greater propensity to "immaturity and irresponsibility," resulting in overrepresentation in "virtually every category of reckless behavior"; increased vulnerability and susceptibility to negative influences, including "peer pressure"; and "more transitory, less fixed" personalities, reflective of less "well formed" character.[78] These attributes of youth, the Court held, "render suspect" both the notion that the death penalty effectively deters teens and "any conclusion

74 *See* Brief for Respondent at 10, 23, *Roper*, 543 U.S. 551 (2005) (No. 03-633), 2004 WL 1947812 [hereinafter Simmons Merits Brief] (quoting Thompson v. Oklahoma, 487 U.S. 815, 825 n.23 (1989) (plurality opinion)) (internal quotes and citations omitted); Reply Brief for Petitioner at 2–5, *Roper*, 543 U.S. 551 (No. 03-633), 2004 WL 2046818 (responding to these arguments); *see also* Aronson, *supra* note 2, at 115 ("A key element of Simmons's defense was new brain imaging evidence suggesting that the adolescent brain is not as well developed as an adult's brain.").

75 *See* Oral Argument at 28–29, *Roper*, 543 U.S. 551 (No. 03-633), 2004 WL 2387647 [hereinafter *Roper* Oral Argument] (statement of Seth Waxman) ("[Y]ou have a scientific community that in *Stanford* was absent . . . the major medical and scientific associations, were not able in 1989, based on the evidence, to come to this Court and say there is scientific, empirical validation for requiring that the line be set at 18."); *see also id.* at 38 ("[W]e know . . . from common sense and it's been validated by science . . . that it is impossible to know whether the crime that was committed by a 16- or 17-year-old is a reflection of his true, enduring character . . . ."); *see also* Haider, *supra* note 58, at 375 (discussing role of neuroscience in oral argument, including a request by Justice Kennedy to comment on it).

76 Brief of the American Medical Ass'n et al. as Amici Curiae in Support of Respondent at 10, *Roper*, 543 U.S. 551 (No. 03-633), 2004 WL 1633549 [hereinafter AMA *Roper* Brief]; *see also id.* at 2 ("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."); Brief for the American Psychological Ass'n, and the Missouri Psychological Ass'n as Amici Curiae Supporting Respondent at 9–12, *Roper*, 543 U.S. 551 (No. 03-633), 2004 WL 1636447 (making neuroscience arguments).

77 *Roper*, 543 U.S. at 569–70.

78 *Id.* (internal quotation marks and citations omitted).

that a juvenile falls among the worst offenders."[79] For these and other reasons it struck down the juvenile death penalty.[80] However, the influence of neuroscience was unclear. The Court drew most of its language from prior decisions, none of which had relied on brain science,[81] and remarked that "any parent knows" that teenagers are immature.[82] It buttressed this experiential observation by noting that "the scientific and sociological studies respondent and his *amici* cite tend to confirm" it,[83] but nowhere specified which amicus briefs it found relevant and persuasive.[84] These ambiguous signals, though, were seen in light of the 2002 *Stanford* dissent, the prominence of neuroscience in briefing and argument, and the broader societal context—one fascinated with the teen brain—within which the case was decided.

Developmental neuroscience thus came to be regarded—accurately or not—as a major influence on the highest-profile juvenile case in decades.[85]

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79 *Id.* at 570.

80 *Id.* at 575.

81 *See id.* at 569–70; *see also* Johnson v. Texas, 509 U.S. 350, 359–62 (1993) (agreeing that youth is relevant to appropriateness of death penalty); Eddings v. Oklahoma, 455 U.S. 104, 110–12 (1982) (reasoning that juveniles are more vulnerable and impulsive and less self-disciplined and future-oriented than adults).

82 *Roper*, 543 U.S. at 569; *Roper* Oral Argument, *supra* note 75, at 39–40 (statement of Breyer, J.) ("[W]hat I thought the scientific evidence was getting at, that it simply confirms what common sense suggests . . . [and] simply corroborated something that every parent already knows . . . .").

83 *Roper*, 543 U.S. at 569. The reference to "scientific" sources may, but does not necessarily, indicate brain science, as it encompasses all references to psychology and all social-science findings not categorized as "sociology." Five amicus briefs, including the AMA and APA briefs, referenced scientific sources. *See, e.g.*, Brief Amicus Curiae of the American Bar Ass'n in Support of the Respondent at 9–10, *Roper*, 543 U.S. 551 (No. 03-633), 2004 WL 1617399.

84 Morse, *supra* note 59, at 410 ("Perhaps the neuroscience evidence actually played a role in the decision . . . but there is no evidence in the opinion to support this speculation.").

85 *See Putting the Juvenile Back in Juvenile Justice*, *supra* note 7, at 6 ("In light of this new evidence about adolescent development, the U.S. Supreme Court . . . outlawed the death penalty for youth."); Tamar R. Birckhead, *The Age of the Child: Interrogating Juveniles after* Roper v. Simmons, 65 WASH. & LEE L. REV. 385, 395–400, 413 (2008) (noting that the *Roper* Court emphasized scientific evidence); Jeffrey Fagan, *Adolescents, Maturity, and the Law: Why Science and Development Matter in Juvenile Justice*, AM. PROSPECT, Sept. 2005, at A7 (evidence about teen brains "was an important part" of Court's decision); Krueger, *supra* note 2, (*Roper* "took into consideration the incomplete brain development in juveniles").

C. *Adolescent Brain Science Beyond* Roper

Since *Roper* many scholars and advocates have urged that such science holds enormous potential to transform juvenile justice well beyond the death penalty.[86] Such post-*Roper* claims run the gamut from the broad to the specific. The vast majority are based on a combination of developmental psychology and neuroscience, with the findings of the latter being invoked generally to buttress the reliability of the former.[87] Scholars regard that buttressing as critically important, on the theory that it lends a "hard science" edge to behavioral findings that might otherwise be dismissed as inordinately "soft."[88] To

86 *See, e.g.*, RETHINKING THE JUVENILE, *supra* note 7, at 7, 10 (arguing that "the brain development-juvenile justice link is a work in progress, but it is the key to" an improved juvenile justice system, including "determining which children to treat in the juvenile system and what sort of treatments will be most effective"); Donna M. Bishop & Hillary B. Farber, *Joining the Legal Significance of Adolescent Developmental Capacities with the Legal Rights Provided by* In re Gault, 60 RUTGERS L. REV. 125, 172–73 (2007); *see also* Aronson, *supra* note 2, at 117 ("[J]uvenile justice advocates are currently seeking to expand the scope of the *Roper* decision and to use neuroscientific evidence for a variety of non-death penalty related issues."); Naomi Cahn, *Poor Children: Child "Witches" and Child Soldiers in Sub-Saharan Africa*, 3 OHIO ST. J. CRIM. L. 413, 430 (2006) (characterizing legal implications of developmental neuroscience as "staggering"); Ill. Office of the State Appellate Defender, Registration Form for 4th Annual Midwest Juvenile Defender Summit, July 17, 2008, *available at* http://www.state.il.us/DEFENDER/acrobatdocs/juvdefreg2008.pdf (proposing that brain-science insights could be used to challenge statements of victims, witnesses, and clients, and could inform interviews of adolescent clients); MacArthur Found. Research Network on Adolescent Dev. & Juvenile Justice, Presentation on Adolescent Development and Criminal Blameworthiness, at slide 29 (2006), http://www.adjj.org/downloads (describing "The Immaturity Gap" between adolescents and adults).

87 *See, e.g.*, David O. Brink, *Immaturity, Normative Competence, and Juvenile Transfer: How (Not) to Punish Minors for Major Crimes*, 82 TEX. L. REV. 1555, 1571–72 (2004) (noting "emerging evidence that the neurological correlates" of "cognitive, social, and emotional capacities are undergoing crucial development throughout adolescence"); Suzanne Meiners-Levy, *Challenging the Prosecution of Young "Sex Offenders": How Developmental Psychology and the Lessons of* Roper *Should Inform Daily Practice*, 79 TEMP. L. REV. 499, 507 (2006) (stating that studies of "adolescent brain development [have] lent powerful support to the work of developmental psychologists").

88 *See* Aronson, *supra* note 2, at 133 (proposing that psychological testimony is "perceived as soft" while brain images are perceived as "hard"); Tamar R. Birckhead, *North Carolina, Juvenile Court Jurisdiction, and the Resistance to Reform*, 86 N.C. L. REV. 1443, 1463–64 (2008) ("In a society evermore dependent upon science and technology, advocates' increasing emphasis on hard science has earned them some support."); Staci A. Gruber & Deborah A. Yurgelun-Todd, *Neurobiology and the Law: A Role in Juvenile Justice?*, 3 OHIO ST. J. CRIM. L. 321, 331–32 (2006) (contrasting attitudes between behaviors caused by "differences in brain structure or function" with those attributable to "environmental or social factors"); Robert E. Shepherd, Jr., *The Relevance of Brain Research to Juvenile Defense*, CRIM. JUST. MAG., Winter 2005, at 51, 51

the extent that the psychological and neurological strands are separable, this Section briefly articulates those aspects of the claims that rely on assertions about the teen brain. The next Part demonstrates how such claims have fared (and are likely to fare) when put to the test in the courts.

The most generalized claim is that evidence of population-typical brain immaturity during the teenage years both reinforces the original impulse to create a separate system of adjudication and treatment for juveniles and counsels recommitment to that system.[89] Perhaps the most prominent contemporary scholars of developmental science and juvenile justice, Elizabeth S. Scott and Laurence Steinberg, articulate this notion in *Rethinking Juvenile Justice*,[90] a 2008 book described by one scholar as representing the "gold standard in legal-developmental collaboration."[91] Their central brain-based claims may be synopsized as follows. First, structural immaturity in a normal teenager's frontal lobes may explain her relative deficiency in imagining the future, including the long-term consequences of her actions.[92] Second, puberty-linked changes in the brain's reward circuitry and in its hormone production predispose that teen to seek novelty and to value the rewards of risky behavior more than its risks.[93] Third, the relative weakness of neural connections between frontal cortices and those brain areas associated with primary social and emotional processing contributes to her poor impulse control and emotional regulation.[94] Fourth, because brain regions associated with executive function fully mature only in late adolescence and early adulthood, while those associated with primary emotional arousal and social information mature shortly after puberty, that teenager will for some years experience a "maturity gap" during which she is attracted to risky or irresponsible behaviors that she lacks full capacity to appreciate or control.[95] Thus,

("hard science" supports what policymakers know from behavioral studies and "what they have intuitively known from their personal experiences"); *see also* Brown & Murphy, *supra* note 36 (manuscript at 69) (asking whether advocates are using brain images "*specifically for* their prejudicial effect," as they might thus persuade factfinders to "accept psychological constructs that would otherwise be suspect as 'soft' science").

89 *See, e.g.*, RETHINKING THE JUVENILE, *supra* note 7, at 4.

90 SCOTT & STEINBERG, *supra* note 5, at 28, 44–50 (arguing that "scientific knowledge," including "neurobiological" knowledge, about adolescent development "should be the foundation of the legal regulation of juvenile crime").

91 Buss, *supra* note 13, at 493.

92 SCOTT & STEINBERG, *supra* note 5, at 40.

93 *Id.* at 42–43, 48.

94 *Id.* at 44–45.

95 *Id.* at 48–49. *See also Hearing on Adolescent Brain Development and Juvenile Justice*, *supra* note 10, at 2 (testimony of Laurence Steinberg, Ph.D.) ("[M]iddle adolescence

the normal attributes of the teen brain add up to "a prescription for bad choices," generally reflective more of normative developmental process than of bad character.[96] These aspects of adolescent brain development, as manifested in behavior, should mitigate the law's response to juvenile offending. A teenager is not (like a child) so compromised as to be fully excused, but neither is she fully responsible, a status she will attain only once she has finished this critical stage of maturation. A sound juvenile justice system ought to reflect, in all its particulars, such a theory of mitigation.[97]

Scott and Steinberg's basic theory, which may be called the "diminished culpability" model, has been endorsed to some degree—and often completely—by virtually every scholar, advocate, and defender now seeking to expand the influence of neuroscience within juvenile justice.[98] Specific claims fall at every possible point along the life course of a juvenile proceeding. What follows is a brief sketch of the range of such claims.

Waiver of rights. Adolescents' impulsivity and relatively deficient decisionmaking processes, particularly when under stress, render them less able to knowingly, intelligently, and voluntarily consent to searches, participate in identification procedures, waive *Miranda* rights, confess, waive counsel, or enter a guilty plea.[99] Juveniles may

. . . is a period of heightened vulnerability to risky and reckless behavior, including crime and delinquency. The engines are running at full throttle, but there is not yet a skilled driver behind the wheel.").

96 SCOTT & STEINBERG, *supra* note 5, at 49.

97 *Id.* at 121–26.

98 *See, e.g.*, Cahn, *supra* note 86, at 447 (positing that neuroscience shows why children in sub-Saharan Africa and other developing nations are easily turned into soldiers, and should be rehabilitated rather than punished); Nina W. Chernoff & Marsha L. Levick, *Beyond the Death Penalty: Implications of Adolescent Development Research for the Prosecution, Defense, and Sanctioning of Youthful Offenders*, 39 CLEARINGHOUSE REV. 209, 210–11 (2005); CRIMINAL JUSTICE SECTION, AM. BAR ASS'N, REPORT TO THE HOUSE OF DELEGATES 10–15 (2008), *available at* http://www.abanet.org/crimjust/policy/juvenilesentencing.pdf; Shepherd, *supra* note 71, at 75 ("Children—adolescents—are responsible for their acts, but they are not as responsible as mature adults."); Shepherd, *supra* note 88, at 52 (stating that juvenile's behavioral traits are "built in—literally hard-wired into the adolescent brain—and are not aberrant symptoms of moral weakness").

One partial exception is Christopher Slobogin & Mark R. Fondacaro, *Juvenile Justice: The Fourth Option*, 95 IOWA L. REV. (forthcoming 2009) (on file with author). While offering a similar account of the brain science, Slogobin and Fondacaro argue in favor of a model focused not on juveniles' relative culpability but their lesser deterrability. *Id.* (manuscript at 43–57).

99 *See* Chernoff & Levick, *supra* note 98, at 215; Bishop & Farber, *supra* note 86, at 172 ("Some of the most defining characteristics of adolescence—impetuosity, susceptibility, and immaturity, which *Roper* explains make children less culpable than

assert or waive such rights, but because of their brain immaturity they should not be allowed to do so absent meaningful adult guidance and as non-coercive a context as possible.[100]

Competence. Neuroscience buttresses research showing that younger juveniles are less likely than adults to demonstrate adjudicative competence[101]—that is, the ability to understand proceedings, consult with and assist counsel, and make critical decisions in a minimally rational and self-protective manner.[102] Normal developmental immaturity therefore ought to provide a basis for finding a juvenile incompetent, particularly in adult court, even if she cannot demonstrate a psychiatric disorder, developmental disability, or neurological abnormality relative to other teens.[103]

Transfer to adult court. To transfer a minor to adult court for prosecution is to engage in a legal fiction out of step with developmental reality.[104] Juveniles may commit crimes that cause as much harm as an adult's crime, but those equivalencies do not obviate brain-devel-

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adults—are significant impediments to a juvenile's ability to appreciate and exercise his right to counsel and his right not to incriminate himself."); Fagan, *supra* note 85, at A7 (stating that brain immaturity helps explain why "adolescents are overrepresented among defendants who give false confessions"); Shepherd, *supra* note 88, at 52 (emphasizing greater need for caution with evidence obtained from juvenile confessions and consent searches).

100 *See* Chernoff & Levick, *supra* note 98, at 215–16; Birckhead, *supra* note 85, at 429–32 ("[Y]outh may be incapable of adult reasoning during questioning because of the long maturation process of the adolescent brain."); *id.* at 446–47 (encouraging use of expert testimony on teen brain development to determine youth's perceptions of whether they are in custody and their responses to interrogation).

101 *See, e.g.*, Fagan, *supra* note 85, at A7 ("[T]he developmental deficits of immaturity that make [teens] less culpable may also make them less competent defendants . . . ."); Shepherd, *supra* note 88, at 52.

102 Maroney, *supra* note 51, at 1376, 1391.

103 Steinberg and Scott, in a pragmatic move not entirely consistent with their theoretical model, contend that while such developmental immaturity should provide a basis for an incompetence finding in adult court, it ought to provide no such basis in a juvenile court. SCOTT & STEINBERG, *supra* note 5, at 168–74.

104 *See* Aronson, *supra* note 2, at 117 (describing advocate's claim that scientific evidence "could be used to slow or stop the automatic transfer of juveniles to adult criminal courts"); Lisa McNaughton, *Extending* Roper *'s Reasoning to Minnesota's Juvenile Justice System*, 32 WM. MITCHELL L. REV. 1063, 1071–72 (2006) (citing brain research in support of argument that automatic transfer scheme is unconstitutional); Enrico Pagnanelli, Note, *Children As Adults: The Transfer of Juveniles to Adult Courts and the Potential Impact of* Roper v. Simmons, 44 AM. CRIM. L. REV. 175, 176 (2007) (asserting that teens' "social, physiological, and psychological underdevelopment . . . demand[ ] a reexamination of current transfer policies"); Fagan, *supra* note 85, at A5 (arguing that the "push to treat more kids as adults" is "contradicted by new behavioral and biological research about maturity and criminal culpability").

opment differences relevant to both culpability and amenability to reform.[105] Transfer should be abolished or, if allowed, triggered only by specific findings by a juvenile court judge focused on the attributes of the individual juvenile.[106]

Mens rea and mental-state defenses. Because of brain immaturity, juveniles are less able or likely to form "specific intent" to carry out a particular action or to cause a particular result.[107] Instead, their choices tend to be impulsive, and they are unlikely fully to contemplate consequences.[108] Even when a juvenile can and does form the requisite mental state, that mens rea is a relatively poor proxy for culpability and future dangerousness.[109] Further, assessment of both

105 *See, e.g., Hearing on Adolescent Brain Development and Juvenile Justice, supra* note 10, at 1–4 (testimony of Jennifer L. Woolard, Ph. D) (offering synopsis of relationship between brain and behavioral aspects of developmental science and asserting that together they "support a fundamental tenet of the juvenile justice system," that juveniles are not "'miniature adults' simply because they are capable of committing certain offenses"); RETHINKING THE JUVENILE, *supra* note 7, at 16 (describing "incongruous" scenario in which "a 10-year-old who biologically cannot understand the long-term consequences of a murder is treated as an adult for commission of that crime").

106 MACARTHUR FOUND. RESEARCH NETWORK ON ADOLESCENT DEV. & JUVENILE JUSTICE, ISSUE BRIEF 3: LESS GUILTY BY REASON OF ADOLESCENCE 4 (2006) [hereinafter LESS GUILTY BY REASON OF ADOLESCENCE], *available at* http://www.adjj.org/downloads/6093issue_brief_3.pdf (arguing that because of difficulty in making individual assessments of maturity, including by reference to "brain images," all individuals under 18 presumptively should be treated as juveniles, with limited exceptions for the few youth who "have exhausted the resources and patience of the juvenile justice system" and are very dangerous); Fagan, *supra* note 85, at A7 (stating that "neuropsychological research" counsels against "laws that funnel adolescents wholesale into the adult courts" and the "remedy is to rely on case-by-case assessments by judges").

107 *See* Aronson, *supra* note 2, at 117–18 (describing advocate's claim that scientific evidence will alter mens rea concepts because teens are in a "natural state of diminished capacity"); Chernoff & Levick, *supra* note 98, at 214 ("[F]act finders should be required to consider the intent element of an offense in light of the research on adolescent incapacities.").

108 *See Hearing on SB 513, supra* note 73, at 17 (Testimony of Daniel Jackson, M.D.) (drawing distinction between "impulsive" and "predatory" aggression and asserting that most juvenile crimes reflect the former); LESS GUILTY BY REASON OF ADOLESCENCE, *supra* note 106, at 2 (proposing that teens' impulsivity, "lack of foresight," and tendency to focus on "immediate gratification" may lead to "bad decisions" in committing crime); RETHINKING THE JUVENILE, *supra* note 7, at 22 ("We now know that the areas of the brain not yet developed by adolescence are those that inhibit commission of crimes.").

109 *See* Chernoff & Levick, *supra* note 98, at 214 (arguing that evidence that would indicate an adult formed specific intent may not indicate that "more precise and elevated form of intent" in a juvenile); *cf.* Roper v. Simmons, 543 U.S. 551, 557–58, 578 (2005) (prohibiting death penalty for juveniles despite proof that individual defendant possessed most culpable mens rea).

criminal intent and defenses based on a "reasonable person" standard should adopt the perspective of someone with an age-typical brain.[110] Structural and functional brain immaturity also undermines the application to juveniles of the felony murder doctrine[111] and accomplice liability.[112] Doctrine in each of these areas reflects baseline assumptions about rationality and forethought that are inapposite for the typical juvenile.

Imposition of adult punishment. "Adult" punishments—sentences that appear on the juvenile's public, permanent record, include state control for longer periods of time than permitted in the juvenile system, and/or are at least partially served in adult institutions—never should be imposed, whether as a result of transfer or a "blended sentencing" scheme.[113] Such sentences are disproportionate to juvenile

110 *See* Aronson, *supra* note 2, at 118 (describing one advocate's claim that scientific evidence produces new idea of the "reasonable adolescent" (internal quotation marks omitted)). This idea was proposed pre-*Roper* and relied on developmental psychology. *See* Taylor-Thompson, *supra* note 16, at 145 (arguing that defense of "developmental negligence" should be available to youth charged in adult court with specific intent crimes or accomplice liability); *see also* J.R. v. Alaska, 62 P.3d 114, 119 (Alaska Ct. App. 2003) (adopting reasonable adolescent standard).

111 The felony murder rule affects a large number of juveniles and frequently exposes them to mandatory transfer and lengthy sentences. *See* Steven A. Drizin & Allison McGowen Keegan, *Abolishing the Use of the Felony-Murder Rule When the Defendant Is a Teenager*, 28 NOVA L. REV. 507, 537–41 (2004). An estimated one-fourth to one-half of juvenile life without parole (JLWOP) sentences were imposed after felony murder convictions. *See* HUMAN RIGHTS WATCH & AMNESTY INT'L, *supra* note 56, at 27–28.

112 Accomplice liability is particularly important because much youth crime is committed in groups. *See* HUMAN RIGHTS WATCH & AMNESTY INT'L, *supra* note 56, at 1–2 (finding that more than one-fourth of JLWOP sentences for felony murder are imposed on accomplices); OFFICE OF JUSTICE PROGRAMS, NAT'L INST. OF JUSTICE, U.S. DEP'T OF JUSTICE, CO-OFFENDING AND PATTERNS OF JUVENILE CRIME 6 ex. 3 (Dec. 2005), *available at* http://www.ncjrs.gov/pdffiles1/nij/210360.pdf (reporting that the majority of youth crime is committed in groups). The claim is that minors' vulnerability to peer pressure may indicate that actions taken to further the criminal activity of another frequently are motivated by unreflective loyalty, not underlain by the required dual intents to assist and that the crime be committed. *See* MODEL PENAL CODE § 2.06 (1985) (defining mens rea for accomplice liability); Chernoff & Levick, *supra* note 98, at 214; *see also* Taylor-Thompson, *supra* note 16, at 167–68 (examining a possible extension of developmental defenses).

113 Chernoff & Levick, *supra* note 98, at 211; *see also* JUVENILE JUSTICE COMM., AM. BAR ASS'N CRIMINAL JUSTICE SECTION, MITIGATING CIRCUMSTANCES IN SENTENCING YOUTHFUL OFFENDERS 1, 11 (2008), http://www.abanet.org/crimjust/policy/juvenilesentencing.pdf (noting that *Roper*'s conclusions apply "with equal force to all sentences for juvenile offenders" and to parole determinations). A "blended sentencing" scheme is one in which a court imposes a juvenile disposition and an adult sanction, the latter often being stayed pending successful completion of the former. *See,*

offenders' diminished culpability and ignore the developmental reality that most will desist criminal behavior naturally as their brains mature.[114] Such sentences also are unlikely to deter other minors, who inadequately consider consequences.[115] Finally, incarceration (particularly with adults) can distort juveniles' growth at a critical juncture in brain development.[116]

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These claims are not radically different in kind from those regularly made by scholars and advocates on the basis of developmental psychology and "common sense." They are different only insofar as they purport to rest on a different empirical basis—that of neuroscience—and to result in more unshakeable conclusions, as a biological basis for immaturity ostensibly shows immaturity to be more deeply rooted and involuntary than does a psychological basis.[117] They are also different to the extent they suggest that adolescent maturation takes longer than once was thought.[118] Those differences, though,

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e.g., Chauncy E. Brummer, *Extended Juvenile Jurisdiction: The Best of Both Worlds?*, 54 ARK. L. REV. 777, 778–96 (2002).

114 *See* RETHINKING THE JUVENILE, *supra* note 7, at 12 (proposing that "once an adolescent matures into adulthood" and the prefrontal cortex is fully developed, "the natural tendencies toward risk taking are mitigated by increased forethought and crime rates drop precipitously"); Barry C. Feld, *A Slower Form Of Death: Implications of* Roper v. Simmons *for Juveniles Sentenced to Life Without Parole*, 22 NOTRE DAME J.L. ETHICS & PUB. POL'Y 9, 26–40 (2008) [hereinafter Feld, *A Slower Form of Death*]; Barry C. Feld, *Unmitigated Punishment: Adolescent Criminal Responsibility and LWOP Sentences*, 10 J.L. & FAM. STUD. 11, 43–70 (2007); Hillary J. Massey, *Disposing of Children: The Eighth Amendment and Juvenile Life without Parole after* Roper, 47 B.C. L. REV. 1083, 1084, 1091–98 (2006); Brianne Ogilvie, Note, *Is Life Unfair? What's Next for Juveniles after* Roper v. Simmons, 60 BAYLOR L. REV. 293, 307, 313–14 (2008).

115 *See* Steinberg, *supra* note 8 (manuscript at 17) (noting that the ability to anticipate future consequences develops with age).

116 *See, e.g.*, RETHINKING THE JUVENILE, *supra* note 7, at 14 (suggesting adverse brain impact on teens subjected to "sensory deprivation" while incarcerated); *Putting the Juvenile Back in Juvenile Justice*, *supra* note 7, at 6 (proposing that the "malleability of the adolescent brain" contributes to "vulnerab[ility] to sexual exploitation and physical assault" in adult prisons).

117 *See Hearing on Adolescent Brain Development*, *supra* note 10, at 1 (testimony of Laurence Steinberg, Ph.D.) (arguing that "[s]cientific discoveries about brain development have helped us understand *why*" juveniles are different, "but they haven't changed the basic story line" that those differences are real and justify differential treatment).

118 Steinberg, *supra* note 8 (manuscript at 15) (describing "overarching consensus . . . that teenagers are not as neurobiologically mature as we once thought they were").

have not proved as consequential in legal practice as some have predicted.

II. THE LIMITED IMPACT OF ADOLESCENT BRAIN SCIENCE IN THE COURTS

As the previous Part showed, before *Roper* scholars and advocates had begun to envision a powerful role for developmental neuroscience within juvenile justice. Buoyed by apparent success in that case, since *Roper* such theories have proliferated. Defenders and advocates have begun actively to test those theories in cases. To measure the extent to which reality is conforming to predictions, I conducted a study of such cases.[119] As this Part demonstrates, the range of neuros-

119 The methodology was, briefly, as follows. I used Westlaw to identify post-*Roper* cases raising legal issues to which defenders were likely to regard brain science as relevant, and reviewed those cases to detect mention of such science, for example with a search for "JUVENILE /P (LIFE /3 PAROLE) & DA(AFTER 2004) & ROPER" in Westlaw's ALLCASES database. I also searched directly for mention of such science, for example with the search, "(BRAIN /S DEVELOPMENT) & (ADOL! JUVE!)" in the ALLCASES database. In many cases I examined briefing and oral argument. As many criminal and juvenile cases are not reported, I also used broader internet searches, reviewed the secondary literature for clues to relevant cases, and located amicus briefs by advocacy organizations. When I became aware through contacts in the defender community that neuroscience evidence had been argued in unreported cases, I sought public records of the proceedings. At the low-relevance end of the responsiveness continuum were cases in which parties or courts made a quick mention of brain science or the "scientific studies" language of *Roper*. At the high-relevance end were cases in which parties presented testimony of brain-science experts. The last search was conducted on August 13, 2009.

The searches yielded a total of fifty-seven cases, falling at all points along that continuum, five of which are pending. In eleven cases (including one case that is counted here as two because it referenced an unpublished, pending case not otherwise accounted for), developmental neuroscience appears to have been regarded at least somewhat favorably by a court in granting some form of relief to a defendant, almost always in the context of sentencing. In four of those eleven, the defendant given a sentencing concession was a young adult rather than a juvenile. In an additional three cases, developmental neuroscience was referenced by a judge in dissent or concurrence. As discussed below, inclusion in the "possible influence" category was generous; in none of these fourteen cases does developmental neuroscience fairly appear to have been outcome determinative, and in most it was not demonstrably influential.

The project does not claim to be quantitatively authoritative. First, I did not gather primary data on confidential proceedings in juvenile courts. This necessary constraint confines the data set to (a) cases in which the state proceeded against a minor in adult court or (b) juvenile-court cases that are reported, whether because they are not confidential under state law or because the court protected the youth's identity (for example, by use of pseudonym). These criteria capture a great many juvenile cases, but analysis of nonpublic juvenile-court cases might have enriched the

cientific arguments before the courts—state and federal, juvenile and criminal—is both wide and deep. Their impact, however, has been shallow.

This shallow impact, likely surprising to many, cannot be explained fully on the grounds that the science is new or the effort early. Rather, the courts' response to adolescent brain science reflects a frequent disconnect between the questions asked by law and those answered by science. Though courts sometimes cite the science approvingly, they do so only to buttress conclusions otherwise fully explained. The shallow impact also reflects scientific limitations that are genuine and likely to persist. These factors explain how courts generally have responded to developmental neuroscience arguments,

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analysis. Second, I am not likely to have captured the entire universe of relevant, public, but nonreported cases, particularly those resulting in acquittal, or to have detected all cases in which neuroscientific arguments somehow influenced diversion or plea bargaining, the largely invisible methods by which most juvenile cases are determined. Third, in some cases brain science may have influenced prosecutorial discretion, exercise of which is largely invisible. For example, Ruben Gur—a frequent expert—in 2005 asserted that his pre-*Roper* affidavit on brain development on behalf of Hector Huertas had been influential. Ruben C. Gur, *Brain Maturation and the Execution of Juveniles: Some Reflections on Science and the Law*, PA. GAZETTE, Jan./Feb. 2005, at 14 (2005) ("[I]t apparently worked. The Commonwealth decided not to pursue the death penalty in light of scientific findings that the brain does not mature until early adulthood."). Huertas's attorneys did argue that brain science provided one reason why Pennsylvania should be precluded from seeking the death penalty. Motion to Preclude the Commonwealth from Seeking the Death Penalty against a Juvenile and Consolidated Memorandum of Law at 35, 38, 57, Commonwealth v. Huertas, CP 0009-0941 (Pa. Ct. Com. Pleas 2002), *available at* http://www.internationaljusticeproject.org/pdfs/huertasfinaljuvenilechallengemotion.pdf. It is not, however, possible to discern whether the state relied on that evidence in declining ultimately to seek the death penalty. *See* Aronson, *supra* note 2, at 129.

Finally, this Article analyzes only claims based on developmentally normal attributes of the teen brain, not cases in which juveniles claimed abnormality relative to other teens—for example, because of organic brain injury or psychiatric disorder. *See, e.g.*, *In re* Hegney, 158 P.3d 1193, 1205–06 (Wash. Ct. App. 2007) (discussing a neuropsychological evaluation claiming to show deficits consistent with head injury). Such claims should be considered as they would if raised by adults, a topic that is the subject of a separate and growing literature. *See, e.g.*, Nita A. Farahany & James E. Coleman, Jr., *Genetics, Neuroscience, and Criminal Responsibility*, *in* THE IMPACT OF BEHAVIORAL SCIENCES ON CRIMINAL LAW, *supra* note 39, at 183; Brown & Murphy, *supra* note 36 (manuscript at 32–74); Maroney, *supra* note 51, at 1417–25; O. Carter Snead, *Neuroimaging and the "Complexity" of Capital Punishment*, 82 N.Y.U. L. REV. 1265, 1292–99 (2007).

The Appendix, *available at* Notre Dame Law Review, Archive: Vol. 85, No. 1, http://www.ndlawreview.org/archive/issue.php?vol=85&num=1 (also on file with author), contains a listing and description of all cases considered relevant under the above-described methodology.

but also show why that response has some basis. Two additional factors demonstrate why courts should not unduly privilege such claims. First, juvenile justice cannot directly track neuroscience without implicating equality and autonomy concerns, and no adequate limiting principle has yet been articulated. Second, the pressures of legal advocacy incentivize overstatement and often result in inaccuracy; while this tendency can be controlled, it cannot be eliminated.

As this Part will show, then, adolescent brain science has not been (and is unlikely to be) a transformative force in juvenile justice, at least in the courts. Part III argues that the science nonetheless may play some role going forward, and makes clear that the criticisms herein raised do not detract from the normative desirability of many of the policy changes in support of which the science has been invoked.

A. Doctrinal Obstacles

The most frequent shoal upon which post-*Roper* adolescent brain science claims founder is that of existing legal doctrine, which tends to render them either irrelevant or unpersuasive. In some instances, courts perceive that the issue has been foreclosed by legislatures; in others, doctrine directs a relatively narrow inquiry and scientific insights fall largely outside its boundaries.[120] Such disconnects are most clearly seen in cases involving imposition of adult punishment. The language of *Roper* has been widely interpreted so as to undermine its applicability to non-death sentences, review of which is limited. A similarly narrow focus applies to determinations of a juvenile's mens rea or other mental capacity.

Doctrine is not a full independent measure of a claim's intrinsic merit. For example, if a procedural default is held to bar pursuit of an actual innocence claim, that holding says far more about the doctrinal valuation of procedural bars than it does about innocence as an exculpatory factor. Further, doctrine potentially is mutable. The point of this Section therefore is not to endorse the status quo but, rather, to

120 The same doctrinal constraints apply to developmental science generally, though full discussion of that issue is beyond the scope of this Article. Both sorts of claims tend to be invoked simultaneously, and courts that reject the doctrinal relevance of behavioral work also reject that of neuroscience. However, courts that accept as doctrinally relevant some insights from behavioral work do not always credit neuroscientific evidence. Indeed, this is a plausible description of the *Roper* decision. This disparity may be partially explained by the newcomer status of neuroscience relative to behavioral science. It is largely justified, even setting newcomer status aside, as not all of the relevant limitations of neuroscience pertain to behavioral studies. *See infra* note 129.

demonstrate how it currently is operating to diffuse neuroscientific claims. Questions of merit are taken up in the following Section and in Part III.

1. Adult Punishment

Contemporary Eighth Amendment doctrine, under which non-death sentences will be invalidated only if so "extreme" as to be "grossly disproportionate" to the crime,[121] frequently is fatal to juveniles' neuroscientific claims that particular punishments are unconstitutional. Similarly, courts have tended to uphold adult-sentencing schemes against brain-science challenges, hewing to doctrine directing deference to facially reasonable legislative and judicial choices as to which youths, or categories of youths, may or must be tried and punished as adults.[122] The only punishment context in which neuroscience has had discernable, if marginal, impact is in a small number of individual sentencing proceedings, a context in which—unless mandatory sentences apply—judges have considerable latitude.[123] This Section addresses each issue in turn.

Juvenile life without parole. Because *Roper* eliminated the most extreme possible sentence for youth, scholars and advocates quickly have sought to extend its reasoning to the most extreme remaining sentence—juvenile life without parole (JLWOP).[124] As they have

121 Harmelin v. Michigan, 501 U.S. 957, 997 (1991) (Kennedy, J., concurring in part and concurring in the judgment); *see also* Ewing v. California, 538 U.S. 11, 23–24 (2003) (plurality opinion) (adopting Kennedy's *Harmelin* concurrence). Several Justices believe that the Eighth Amendment imposes no proportionality constraint on noncapital sentences. *See id.* at 31–32 (Scalia, J., concurring in the judgment); *id.* at 32 (Thomas, J., concurring in the judgment). *See generally* Richard S. Frase, *Excessive Prison Sentences, Punishment Goals, and the Eighth Amendment: "Proportionality" Relative to What?*, 89 MINN. L. REV. 571 (2005) (tracing the history of proportionality review).

122 *See infra* notes 162–63 and accompanying text.

123 6 WAYNE R. LAFAVE ET AL., CRIMINAL PROCEDURE § 26.4(b), at 744, 746 (3d ed. 2007) ("[I]t could be argued that there is no aspect of a defendant's life that may not be weighed in assessing the appropriate sentence under a discretionary sentencing scheme."); *see also* Williams v. New York, 337 U.S. 241, 247 (1949) (stating that in sentencing a judge should possess "the fullest information possible concerning the defendant's life").

124 *See* Solem v. Helm, 463 U.S. 277, 303 (1983) (noting that if execution is the ultimate penalty life without parole is the "penultimate" one). As this Article is going to press, JLWOP is permitted in the majority of jurisdictions. *See* Adam Liptak, *Locked Away Forever After Crimes as Teenagers*, N.Y. TIMES, Oct. 3, 2005, at A1 (reporting that forty-two states and the federal government allow JLWOP and many states allow its imposition on young children). JLWOP affects far more youth than the death penalty did. *Compare* STREIB, *supra* note 68, at 3 (reporting that 226 juveniles were sentenced to death in the three decades before *Roper*), *with* Connie de la Vega & Michelle Leigh-

argued, developmental science would appear to bear as directly on the underlying purposes of JLWOP—retribution, incapacitation, and deterrence—as on the death penalty.[125] Indeed, the Court has agreed to hear in its October 2009 term two cases challenging the constitutionality of JLWOP as applied to a thirteen-year-old and a sixteen-year-old convicted of nonhomicidal offenses.[126] Both petitioners have made brain-science arguments strongly paralleling those in *Roper*,[127] and largely the same lineup of amicus parties has done the same.[128] The Court's treatment of developmental neuroscience may provide valuable insight, largely absent in *Roper*, to its attitude toward its relevance. Even if no such insight is forthcoming, its decisions clearly will alter the landscape within which JLWOP claims are decided.

Under the existing framework, though, such claims have been nearly uniformly unsuccessful,[129] and adolescent brain science has

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ton, *Sentencing Our Children to Die in Prison: Global Law and Practice*, 42 U.S.F. L. REV. 983, 985 (2007) (reporting that just under 2500 are serving JLWOP).

125 Feld, *A Slower Form of Death*, *supra* note 114, at 10.

126 *See* Sullivan v. Florida, 129 S. Ct. 2157 (2009) (No. 08-7621) (mem.) (granting certiorari to consider the constitutionality of imposing JLWOP on thirteen-year-old convicted of rape); Graham v. Florida, 129 S. Ct. 2157 (2009) (No. 08-7412) (mem.) (granting certiorari to consider the constitutionality of imposing JLWOP on sixteen-year-old convicted of probation violation for robbery and burglary). Because of petitioners' ages and crimes, even if the Court invalidates their sentences, it might leave open the possibility of JLWOP for older teens or those convicted of homicide.

127 *See* Brief for Petitioner at 15–18, *Sullivan*, No. 08-7621 (U.S. filed July 16, 2009); Brief for Petitioner at 39–43, *Graham*, No. 08-7412 (U.S. filed July 16, 2009).

128 *See, e.g.*, Brief for the American Medical Ass'n et al. as Amici Curiae Supporting Neither Party, *Graham*, No. 08-7412 (U.S. filed July 23, 2009), 2009 WL 2247127; Brief for the American Psychological Ass'n et al. as Amici Curiae Supporting Petitioners, *Graham*, No. 08-7412 (U.S. filed July 23, 2009), 2009 WL 2236778 [hereinafter APA *Sullivan* & *Graham* Brief]; *see also* Brief of Amici Curiae J. Lawrence Aber et al. in Support of Petitioners, at 1 *Graham*, No. 08-7412 (U.S. filed July 23, 2009), 2009 WL 2236775 [hereinafter Aber Brief] (explaining interest of "an interdisciplinary group of psychologists, social scientists, and neuroscientists who have devoted their careers to the study of adolescent development and behavior").

129 Courts have rejected a significant number of post-*Roper* Eighth Amendment JLWOP challenges. *See, e.g.*, United States v. Pete, 277 Fed. App'x 730, 734 (9th Cir. 2008) (mem.); Connell v. State, 7 So. 3d 1068, 1076–78 (Ala. Crim. App. 2008); People v. Zhuk, No. C047365, 2008 WL 2781112*32–33 (Cal. Ct. App. July 18, 2008); State v. Wilson, 938 So. 2d 1111, 1146–47 (La. Ct. App. 2006); Foster v. State, 961 So. 2d 670, 671–72 (Miss. 2007). Several JLWOP challenges were in a habeas posture, limiting the scope of the inquiry. *See, e.g.*, Sharikas v. Kelly, No. 01:07cv537, 2008 U.S. Dist. LEXIS 29153 (E.D. Va. Apr. 7, 2008) (mem.); Douma v. Workman, No. 06-cv-0462, 2007 WL 2331883, at *4–5 (N.D. Okla. Aug. 13, 2007) (dismissing equal protection challenge to JLWOP on merits). A number of cases reflect imposition of JLWOP as to which the defendant raised no cruel-and-unusual punishment claim. *See, e.g.*, Daniel v. Parker, No. 05-2273, 2008 WL 3834043 (W.D. Tenn. Aug. 13, 2008);

had no discernable impact. The most commonly articulated justification for rejection of such claims is *Roper* itself, in which the Court appeared in dicta to endorse the Missouri Supreme Court's resentencing of Simmons to "life imprisonment without eligibility for probation, parole, or release except by act of the Governor."[130] Many courts have relied on this dictum.[131] The second major justification is the oft-repeated "mantra" that "death is different"[132]: many courts

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McGilberry v. Epps, No. 1:03CV301LS, 2006 WL 3955828 (S.D. Miss. June 15, 2006). A few post-*Roper* courts have found JLWOP sentences unauthorized by statute. *See, e.g.*, Shepherd v. Commonwealth, 251 S.W.3d 309, 320–21 (Ky. 2008); People v. Her, No. C051473, 2007 WL 4217445, at *12–13 (Cal. Ct. App. Nov. 30, 2007). One court declared JLWOP cruel and unusual where imposed on a fourteen-year-old whose nonhomicide crime caused no injury. *In re* Nuñez, 93 Cal. Rptr. 3d 242, 247 (Cal. Ct. App. 2009) (noting "freakish[ness]" of sentence and that under California law JLWOP would be *prohibited* had Nuñez committed homicide). The *Nuñez* court relied in part on the general developmental principles articulated in *Roper*, but did not reference neuroscience. *See id.* at 256–58.

130 Roper v. Simmons, 543 U.S. 551, 560 (quoting State *ex rel.* Simmons v. Roper, 112 S.W.3d 397, 399 (Mo. 2005)); *cf. id.* at 572 (stating that "[t]o the extent the juvenile death penalty might have residual deterrent effect, it is worth noting that the punishment of life imprisonment without the possibility of parole is itself a severe sanction, in particular for a young person," and noting further that the Governor of Kentucky had so commuted Stanford's sentence). Justice Scalia regards this to be a vulnerable dictum. At oral argument, counsel for Missouri predicted that "if the Court says [juveniles] are immune from . . . capital punishment . . . someone will come and say they also must be immune from . . . life without parole"; Scalia agreed, stating, "I'm sure that would follow. I—I don't see where there's a logical line." *Roper* Oral Argument, *supra* note 75, at 5; *see also Roper* 543 U.S. at 623 (Scalia, J., dissenting) (noting that the Court's reliance on international authority would also dismantle JLWOP sentences).

131 *See, e.g.*, Calderon v. Schribner, No. 2:06-cv-00770-TMB, 2009 WL 89279, at *4 (E.D. Cal. Jan. 12, 2009) ("[*Roper*] not only does not assist [the defendant], it in fact eviscerates his Eighth Amendment argument."); People v. Galvez, No. B194868, 2007 WL 2377339, at *11 (Cal. Ct. App. Aug. 22, 2007) ("*Roper* implicitly recognizes the distinction between the death penalty and LWOP [by approvingly noting Simmons's sentence.]"); Wallace v. State, 956 A.2d 630, 641 (Del. Super. Ct. 2008) ("[T]he United States Supreme Court . . . would not have recognized a sentence of life without parole as an acceptable alternative to death . . . [if it] would violate the Eighth Amendment."); *cf.* United States v. Salahuddin, 509 F.3d 858, 863–64 (7th Cir. 2007) (noting in dicta that *Roper* "permitted imposing a sentence of life imprisonment" on minors).

132 Rachel E. Barkow, *The Court of Life and Death: The Two Tracks of Constitutional Sentencing Law and the Case for Uniformity*, 107 MICH. L. REV. 1145, 1147–49 (2009) (advocating abandonment of death-is-different rationale for limiting noncapital sentencing review, as it is "wrong as a matter of doctrine, and . . . unwise as a matter of policy"); *see also id.* at 1161 (noting that the *Roper* Court's solicitude toward youth has not extended to noncapital sentencing review).

have stated that *Roper* applies only in the death penalty context,[133] and have instead judged JLWOP under the grossly disproportionate standard that, long before *Roper*, underlay the failure of most Eighth Amendment challenges.[134] These long odds have not changed with invocation of brain science.

Courts that have directly addressed neuroscientific claims in the JLWOP context generally have treated the issue as either doctrinally irrelevant or as surplusage. For example, the Wisconsin Court of Appeals upheld a JLWOP sentence imposed on a fourteen-year-old convicted of intentional murder.[135] The court took no issue with the defendant's developmental psychology claims, drawn directly from *Roper*, but held that those factors were properly considered and rejected by the sentencing judge in determining the youth's culpability and dangerousness.[136] Similarly, it took no serious issue with his brain-science claims—including that such research "demonstrates biological reasons for adolescents' inability to control impulses, avoid

133 *See, e.g.*, Culpepper v. McDonough, No. 8:07-cv-672-T-17, 2007 WL 2050970, at *3 (M.D. Fla. July 13, 2007) ("[T]he *Roper* decision is to be narrowly construed [and] does not *particularly* address mandatory life sentences pertaining to minors"); *Connell*, 7 So. 3d at 1077 ("*Roper* applies only in limited circumstances, and we are not in a position to expand that decision as the appellant would have us do.").

134 *See, e.g.*, State v. Allen, 958 A.2d 1214, 1234–35 (Conn. 2008) (stating that "'in the past twenty years, courts have consistently rejected Eighth Amendment claims made by juvenile murderers attacking their life sentences'" and citing dozens of pre-*Roper* cases (quoting Wallace v. State, 956 A.2d 630, 640 (Del. 2007))); Wayne A. Logan, *Proportionality and Punishment: Imposing Life Without Parole on Juveniles*, 33 WAKE FOREST L. REV. 681, 707–08 (1998) (detailing history). Relief from noncapital sentences—even if mandatory and lifelong—is exceedingly rare, even for adults. *See, e.g.*, Solem v. Helm, 463 U.S. 277, 279, 281 (1983) (overturning sentence of life without parole for a "seventh nonviolent felony"—attempting to pass a bad $100 check); Rummel v. Estelle, 445 U.S. 263, 274 n.11 (1980) (noting in dicta that making "overtime parking a felony punishable by life imprisonment" would be grossly disproportionate).

State courts pre-*Roper* did sometimes rely on state law to invalidate JLWOP. *See, e.g.*, People v. Dillon, 668 P.2d 697, 727 (Cal. 1983) (finding cruel and unusual punishment for seventeen-year-old convicted of felony murder); Naovarath v. State, 779 P.2d 944, 944 (Nev. 1989) (overturning LWOP imposed on a thirteen-year-old as a "denial of hope"). Most courts refused such relief, often despite the more generous scope of state law. *See, e.g.*, Harris v. Wright, 93 F.3d 581, 583–85 (9th Cir. 1996) (stating that under California law "[y]outh has no obvious bearing" on proportionality analysis of mandatory JLWOP for fifteen-year-old); Feld, *A Slower Form of Death*, *supra* note 114, at 26–40; Logan, *supra*, at 705–06 & nn.119–20.

135 State v. Ninham, 767 N.W.2d 326, 329–31 (Wis. Ct. App. 2009).

136 *Id.* at 329 (holding that developmental attributes "are factors the sentencing court should weigh when determining parole eligibility," though "Ninham's crime was unusual for its senseless and extreme brutality").

risky behaviors, and make good decisions"—but held that it did not "constitute a new factor. The trial court was aware of the differences between juveniles and adults. Continued medical and scientific research that provides a physiological explanation for the differences is not highly relevant to the sentence."[137] Similar (if more oblique) claims have met a similar fate in other courts, which appear to agree that the science either sheds little light on the individual defendant's crime or personal attributes or adds little to developmental arguments already given adequate due.[138]

Lengthy or harsh adult sentences. Juveniles also have used brain science to challenge other lengthy or harsh sentences.[139] Such challenges stand on even less secure doctrinal footing, as the possibility of parole (even if remote) weighs in favor of constitutionality.[140]

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137 *Id.* at 330–31 (noting defendant's argument that "[r]ecent research also shows adolescents' amygdalas are more active than adults.' The amygdala is closely related to emotionally laden responses. In addition, Ninham argues that mounting research suggests alcohol causes more damage to developing brains of teenagers than previously thought").

138 *See, e.g.*, State v. Craig, 944 So. 2d 660, 661–64 (La. Ct. App. 2006) (failing to address defendant's claim that JLWOP was unconstitutional because of "[t]he principles underlying the decision in *Roper v. Simmons*, bolstered by continuing scientific research," and upholding sentence because of brutality of the offense (internal quotation marks omitted) (alteration in original)); *see also id.* at 664 (explaining that Craig did not demonstrate that he was "'exceptional'" and "'a victim of the legislature's failure to assign sentences that are meaningfully tailored to the culpability of the offender, the gravity of the offense, and the circumstances of the case'" (quoting State v. Johnson, 709 So. 2d 672, 676 (La. 1998))). Similarly, in *Connell*, 7 So. 3d at 1076–77, both the trial court and an appellate court dismissed defendant's JLWOP claim despite amicus briefing that had drawn on the developmental portion of *Roper*, including *Roper*'s nod to scientific studies. *See* Brief of Juvenile Law Center et al. as Amici Curiae in Support of Appellant at 17–19, *Connell*, 7 So. 3d 1068 (No. CR 06-0668); *see also Allen*, 958 A.2d at 1233, 1236 (denying defendant's JLWOP challenge, which had cited to the "sociological and physiological evidence on which *Roper* relied").

139 Some juvenile "virtual lifers" are serving terms exceeding their life expectancies. Feld, *A Slower Form of Death*, *supra* note 114, at 51–52; *see, e.g.*, *In re* Welfare of A.J.F., No. A06-303, 2007 WL 92843, at *4–7 (Minn. Ct. App. Jan. 16, 2007) (sentencing a youth to life plus 408 months); State v. Goins, No. 06-MA-131, 2008 WL 697370, at *5–7 (Ohio Ct. App. Mar. 10, 2008) (sentencing a youth to eighty-four years); State v. Bunch, No. 06-MA-106, 2007 WL 4696832, at *4 (Ohio Ct. App. Dec. 21, 2007) (upholding sentence of eighty-nine years despite developmental principles of *Roper*).

140 The possibility of parole in *Rummel v. Estelle*, 445 U.S. 263, 284–85 (1980) (upholding life sentences with parole eligibility for third nonviolent felony offense), was seen as an important factor distinguishing it, later, from *Solem*. *See also* Ewing v. California, 538 U.S. 11, 30–31 (2003) (plurality opinion) (approving sentence of twenty-five years to life for nonviolent felony theft under California's Three-Strikes Law).

Accordingly, few have prevailed. As in the JLWOP context, courts have tended to take a narrow view of substantive sentencing oversight.[141] They also have tended to dismiss arguments based in developmental neuroscience, often under the rationale that it fails to offer anything meaningfully new but also because it fits poorly with record evidence as to mens rea or aggravating factors.

A cluster of Kentucky cases demonstrates the first rationale. Prior to *Roper*, a number of juveniles pleaded guilty to capital offenses in order to avoid potential execution; each agreed to a sentence of life in prison with the possibility of parole after 25 years.[142] After *Roper* many moved for resentencing on the ground that they should not be held to a sentence agreed to under the shadow of an impermissible penalty.[143] Most argued that the court should take notice of adolescent brain science, which emerged after their pleas were entered. Blake Walker, for example, argued that *Roper* "provides a new framework for our understanding of the appropriate penalties for juveniles in light of adolescent brain development."[144] Similarly, Samuel McMillen argued that *Roper* "explained the constitutional importance of adolescent brain development in sentencing juvenile criminal defendants" and that teens' "lack of full brain development is an even greater mitigating factor now than anyone understood at the time of" his original sentencing.[145] Both the *Walker* and *McMillen* courts, though, refused to order resentencing, unpersuaded either that *Roper* applied or that

141 *See, e.g.*, People v. Browner, No. B198836, 2008 WL 4323723, at *2–4 (Cal. Ct. App. Sept. 23, 2008) (finding fifty-to-life sentence for fifteen-year-old not cruel and unusual); People v. Demirdjian, 50 Cal. Rptr. 3d 184, 186–88 (Cal. Ct. App. 2006) (same).

142 *See* KY. REV. STAT. ANN. § 640.040 (West 2006 & Supp. 2009) (authorizing such sentence for juvenile treated as "youthful offender").

143 *See, e.g.*, Kirkland v. Commonwealth, No. 2007-CA-000100, 2008 WL 2940709 (Ky. Ct. App. Aug. 1, 2008); Cheng v. Commonwealth, No. 2006-CA-002619, 2008 WL 1093886 (Ky. Ct. App. Apr. 11, 2008); Devers v. Commonwealth, No. 2006-CA-002049, 2008 WL 612246 (Ky. Ct. App. Mar. 7, 2008); Gussler v. Commonwealth, 236 S.W.3d 22 (Ky. Ct. App. July 20, 2007); Denton v. Commonwealth, No. 2006-CA-000587 (Ky. Ct. App. Aug. 3, 2007). The defendant in *Devers* had been convicted at trial but reached a sentencing agreement in order to avoid a possible death penalty. *Devers*, 2008 WL 612246, at *1.

144 Walker v. Commonwealth, Nos. 2006-CA-001247, 2006-CA-002074, 2008 WL 1991612, at *2 (Ky. Ct. App. May 9, 2008).

145 McMillen v. Commonwealth, No. 2006-CA-001806, 2007 WL 3406851, at *2 (Ky. Ct. App. Nov. 16, 2007) (internal quotation marks omitted); *see also id.* (discussing defendant's argument that the "*Roper* Court established that juvenile criminal defendants possess diminished culpability when compared to adults due to their adolescent brain development" and "when the [trial court] made its sentencing decision, it was unable to give full and sufficient consideration to the constitutional importance

neuroscience materially changed the factual premises.[146] These and similar cases, to be sure, presented unique difficulties because the petitioners were required to overcome a presumption of the finality of plea bargaining.[147] The *McMillen* court, though, signaled a more general lack of receptivity to neuroscientific arguments, declaring that

> despite the fact that the United States Supreme Court discussed adolescent brain development in very broad and general terms . . . . *Roper* does not contain any language mandating that a trial court must give an offender . . . a new sentencing hearing in order to retroactively apply the *Roper* Court's reasoning regarding adolescent brain development. . . . [T]he *Roper* Court's discussion regarding adolescent brain development. . . . is not retroactive as a constitutional matter.[148]

Neuroscience arguments raised in several other Kentucky cases were dismissed without discussion.[149]

The second rationale is illustrated by *People v. Pratcher*,[150] in which a fifteen-year-old challenged his sentence of fifty years to life for intentional murder. A neuropsychologist testified about adolescent brain development generally, and Pratcher's brain specifically, in support of his arguments that such a sentence was unconstitutionally dispropor-

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of adolescence as a mitigator with respect to the specific level of brain development of juveniles").

146 *Walker*, 2008 WL 1991612, at *2 ("[A] valid plea by a juvenile to any sentence other than the death penalty will NOT be re-opened based upon *Roper*"); *McMillen*, 2007 WL 3406851, at *3 (holding that "because McMillen was sentenced to life in prison without the possibility of parole for twenty-five years, not death . . . *Roper* does not apply").

147 *See, e.g.*, McStoots v. Commonwealth, 245 S.W.3d 790, 791–92 (Ky. Ct. App. 2007) (holding that passage of new law does not render plea agreement involuntary); *see also* Schane v. Cain, No. 07-1068, 2007 WL 4967081, at *3 (W.D. La. Oct. 24, 2007) (upholding JLWOP on basis of plea bargaining principles).

148 *McMillen*, 2007 WL 3406851, at *3–4.

149 *See* Devers v. Commonwealth, No. 2006-CA-002049, 2008 WL 612246, at *1 (Ky. Ct. App. Mar. 7, 2008) (rejecting claim that "circuit court 'was unaware of the full effect of adolescent brain development as it relates to culpability' at the time he was sentenced" (internal quotation marks omitted)); Denton v. Commonwealth, No. 2006-CA-00587, slip op. at 2–3 (Ky. Ct. App. Aug. 3, 2007) (rejecting claims that court failed "to give full and sufficient consideration to the characteristics of adolescent brain development relating to culpability . . . [and] was not fully aware of the relationship between adolescent brain development and culpability, and was thus unable during sentencing to give full and sufficient consideration to the constitutional import of adolescent brain development"). Similar arguments were made obliquely in one other case. *See McStoots*, 245 S.W.3d at 791 (noting defendant's arguments based on the *Roper* Court's statements about developmental maturity).

150 No. A117122, 2009 WL 2332183 (Cal. Ct. App. July 30, 2009).

tionate.[151] The sentencing court, however, found those arguments ultimately unpersuasive in light of the deliberate nature of the crime (including, for example, loading and cocking a rifle for four successive shots), and the appellate court agreed.[152] Other state courts similarly have relied on assessment of high individual culpability to refuse brain-based challenges to multi-decade sentences imposed on defendants as young as twelve.[153]

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151 *Id.* at *10–11 (describing testimony of Dr. Myla Young). In addition to describing normal adolescent brain development, Dr. Young performed a SPECT scan on Pratcher's brain, concluding that he was particularly "dysfunctional," but she acknowledged that "[i]t's unclear whether we're talking about frontal lobe damage or immaturity." *Id.* at *11 n.7.

152 *Id.* at *44–50 (discussing, inter alia, the *Roper* JLWOP dictum, state-court precedent, and the factual findings of the sentencing court, though noting that Pratcher "presented evidence at trial both that adolescents' brains are immature and that appellant was immature even for a 15-year-old").

153 *See* State v. Pittman, 647 S.E.2d 144, 163 (S.C. 2007) (upholding concurrent thirty-year terms for twelve-year-old); *see also* People v. Diaz, No. F052637, 2008 WL 5273910, at *5–8 (Cal. Ct. App. Dec. 22, 2008) (affirming seventy-five-to-life sentence for seventeen-year-old convicted of attempted murders, despite amicus briefing that included a neurodevelopmental argument); People v. Ostio, No. G037826, 2008 WL 2461807, at *6 (Cal. Ct. App. June 19, 2008) ("Citing a recent article on adolescent brains . . . Ostio contends his youth operates to diminish his personal culpability. We acknowledge recent precedent prohibiting the use of the death penalty for youthful offenders. However, in light of the seriousness of Ostio's crime . . . the sentence of 25 years to life does not [constitute] cruel and unusual punishment." (citations omitted)); People v. Nguyen, No. G035181, 2006 WL 1493699, at *5 (Cal. Ct. App. May 31, 2006) (upholding an indeterminate term of life plus twenty-five years to life for fifteen-year-old and stating "[r]egardless of whether the nature of the adolescent brain produces behavior that is more impulsive than an adult's, as defendant asserts, his conduct in this case reveals a high degree of individual culpability"); State v. Chavarria, 208 P.3d 896, 898–99 (N.M. 2009) (upholding life sentence with possibility of parole following seventeen-year-old's guilty plea to murder despite expert testimony by psychiatrist and psychologist about teen brain development; sentencing court said that while it had "heard . . . about the adolescent mind" it was convinced that defendant "knows exactly what he's doing" and the "consequences of his behavior" and the plea agreement); State v. Groenke, No. 2006AP1712, 2007 WL 1064088, at *4 (Wis. Ct. App. Apr. 10, 2007) (rejecting as "conclusory and undeveloped" defendant's claim that sentencing court had taken inadequate account of his age and brain immaturity).

Gabriel Mendoza Gonzales, convicted pre-*Roper* for a crime committed at age fifteen and sentenced to forty years, brought neuroscientific evidence before an appellate court in a habeas petition filed concurrently with his post-*Roper* appeal. *See* Petition for Writ of Habeas Corpus at 27–29, People v. Gonzales, Nos. E036344, E037793 Cal. Ct. App. July 29, 2005) (arguing that sentence was unconstitutional in light of brain science); *id.* at 36–37 exs. A, B (citing NAT'L INST. OF MENTAL HEALTH, TEENAGE BRAIN: A WORK IN PROGRESS (2001) [hereinafter NIMH, TEENAGE BRAIN], *available at* http://www.nimh.nih.gov/publicat/teenbrain.cfm; Mark Moran, *Adolescent Brain Development Argues Against Teen Executions*, PSYCHIATRIC NEWS, May 16, 2003,

Though most adult-punishment challenges referencing brain science have failed, it is worth noting a small countertrend. In two cases, state courts relied on developmental principles—possibly including neuroscience—to limit extraordinarily long sentences, once by allowing the eventual possibility of discretionary parole[154] and once by imposing a term of years well below the maximum.[155] These were individual, not categorical, determinations; the same courts refused to limit juvenile sentences generally or to invalidate mandatory minimum sentences for youth.[156] Two additional state courts also appear to have relied in small part on brain science to invalidate juvenile sex-offender registration, once by removing a juvenile from the list and once by invalidating the entire registration scheme.[157] This group of

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at 8, *available at* http://pn.psychiatryonline.org/cgi/content/full/38/10/8). The court was not receptive. People v. Gonzales, Nos. E036344, E037793, 2005 WL 1799520, at *1 n.3, *7 (Cal. Ct. App. July 29, 2005) (rejecting as irrelevant an argument from Gonzales's petition based on "'emerging consensus among psychiatrists and other mental health professionals . . . that the teenage brain does not function and process information the same way as an adult brain'").

154 Citing, inter alia, the "scientific and sociological studies" language from *Roper* and "the literature regarding juveniles that supported that position," the sentencing court determined that "in spite of [the juvenile's] horrific crimes, there was some possibility that [he] would change by the time he was eligible for parole at approximately age fifty" and imposed a sentence of ninety-nine years with parole eligibility after thirty-three. Cotting v. State, No. A-9909, 2008 WL 4059580, at *3 (Alaska Ct. App. Sept. 3, 2008). That sentence was upheld as "not clearly mistaken" by the appellate court. *Id.*; *see also* Ling v. State, No. A-9228, 2008 WL 2152028, at *2 (Alaska Ct. App. May 21, 2008) (approving identical decision by different trial court to allow a juvenile's eventual eligibility for parole, nowhere mentioning "scientific studies" but referring instead to "the factors that the Supreme Court considered in *Roper*"and the fact "that it was not uncommon for teenagers to make poor decisions").

155 *See* State v. Carrasquillo, 962 A.2d 772, 775–76 (Conn. 2009) (discussing the testimony of Carrasquillo's expert, a psychiatrist, about "development of the adolescent brain generally and the defendant's cognitive development in particular," focusing on "significant differences between the adolescent brain and the adult brain"). The sentencing court accepted that Carrasquillo's "judgment" and "thinking" were "in development," but stated that such mitigation "only goes so far"; the court sentenced him to thirty-five years, more than the mandatory twenty-five but less than the authorized life term. *Id.* at 776–78 (internal quotation marks omitted). The Connecticut Supreme Court upheld the sentence. *Id.*

156 *See Cotting*, 2008 WL 4059580, at *2 (rejecting defense request to limit sentence to sixty years); *Ling*, 2008 WL 2152028, at *2 (same); *Carrasquillo*, 962 A.2d at 777–78 (noting that propriety of a mandatory twenty-five-year sentence was not affected by *Roper* and stating that "[t]he delineation between juveniles and adults for purposes of prosecution and punishment is a public policy determination reserved to the legislative branch").

157 *See* Fletcher v. State, No. 0404010688, 2008 WL 2912048, at *1 (Del. Fam. Ct. June 16, 2008) (expunging record and removing juvenile from registry based on evi-

cases indicates that developmental neuroscience sometimes may work to solidify a holding—whether individual or categorical—where a court regards developmental principles as both persuasive and relevant to punishment and sees brain science as informing, in some way, those principles.

As most punishment cases indicate, though, courts tend to view the findings of developmental neuroscience as either irrelevant to the specific determination before them or as insufficiently persuasive as to invalidate schemes for imposition of non-death sentences.[158]

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dence of rehabilitation). The Delaware judge did not directly consider developmental neuroscience but, as a small part of a lengthy decision, approvingly quoted an unpublished opinion by a Nevada family court judge invalidating application of that state's registration scheme to juveniles. *Id.* at *17–18 (discussing without citation an April 2008 decision of family court judge William O. Voy in Clark County, Nevada). The Nevada court listed five reasons why the scheme jeopardized the rehabilitative mission of juvenile justice; the fact that "the brain of an adolescent is still undergoing physical development" was one of them. *Id.*; *see also In re* Louis A., No. 51676, 2008 WL 6043828, at *2 (Nev. Sep 5, 2008) (refusing on jurisdictional grounds to hear state's appeal of family court judge's invalidation of state juvenile sex-offender scheme).

Adolescent brain science has come up in two additional sex-offense cases, both civil commitment proceedings in which the state sought to confine young adults as sexually violent predators. In one case the appellate court noted an expert's opinion that defendant's abuse of an eight-year-old when he was fourteen was insufficient evidence of "paraphilia" because "there is 'plasticity' in the sexuality of a juvenile offender as behavior evolves and the brain develops." *See In re* Benton, No. 57779-4-I, 2008 WL 2487927, at *4–5 (Wash. Ct. App. June 23, 2008) (citing testimony as one example of why jury may have been confused about definition of "paraphilia"). Though the court required a new hearing, its decision hinged on the prosecutor's improper suggestion to the jury that it need not find the defendant had paraphilia. *Id.* Another appellate court rejected an eighteen-year-old's complaint that the commitment court should have taken "judicial notice" of brain development. *See In re* Shell, No. A08-1043, 2009 WL 1182152, at *7 (Minn. Ct. App. May 5, 2009) ("Scholarly articles discussing the ongoing scientific research on the adolescent brain and how it differs from the adult brain are not 'sources whose accuracy cannot reasonably be questioned,' and the court properly declined to take judicial notice of them." (quoting FED. R. EVID. 201)).

158 *See, e.g.*, State v. Carissa M., No. YR-2006-0004 (N.M. Dist. Ct. July 26, 2007). Carissa McGee, sixteen, non-fatally stabbed her mother and sister and was convicted in adult court. Her attorneys relied on adolescent brain science and her diagnosed psychiatric illness to argue that she be sentenced as a "Youthful Offender," which would have permitted treatment in the juvenile system. *See* Child-Defendant Carissa McGee's Memorandum in Aid of Disposition at 4–5, *Carissa M.*, No. YR-2006-0004 (N.M. Dist. Ct. July 26, 2007); *see also id.* at app. (summarizing the findings and potential significance of neuroscience for McGee's case). McGee was nonetheless sentenced to twenty-one years in adult prison, with nine years deferred. *See* Docket Entry for July 26, 2007, *Carissa M.*, No. YR-2006-0004 (N.M. Dist. Ct. July 26, 2007).

2. Transfer to Adult Court

Brain-based challenges to the transfer of minors to adult court also have been relatively ineffective. This area of law is closely related to adult punishment, as such punishment—for example, incarceration beyond the twenty-first birthday—generally may be imposed only following transfer. Historically, transfer decisions were left to juvenile court judges, who had authority to find that a particular youth warranted adult treatment.[159] Legislatures provided broad parameters within which that discretion was exercised—for example, by setting an age below which transfer was unauthorized—bounded on the outside by due process principles.[160] Increasingly, though, states allow prosecutors to determine the court in which to proceed, or provide for legislative transfer, in which adult jurisdiction follows automatically from the state's selection of a particular charge against a person of a prescribed age.[161]

Nonindividualized transfer. Well before the advent of developmental neuroscience, young people had argued that these newer schemes unconstitutionally exposed them to adult punishment without the benefit of an individualized hearing on their maturity, culpability, and potential for rehabilitation. Virtually all such challenges failed.[162] Courts overwhelmingly deferred to legislatures' choices as to what

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Another case raising a cruel-and-unusual-punishment challenge to a term of years is pending. *See* Petitioner Charles Andrew Williams's Memorandum of Points and Authorities in Support of his Motion to Stay the Federal Habeas Petition to Permit Petitioner to Return to State Court to Attempt to Exhaust All Unexhausted Claims at 11, Williams v. Ryan, No. 3:05-cv-00737-WQH-WMC (S.D. Cal. Apr. 1, 2007) (arguing that "advancing medical technologies that provide insight into the brain development of juveniles . . . directly relate[ ] to Petitioner's assertion that his sentence of two consecutive 25 years to life terms" is cruel and unusual); *see also infra* note 180 (discussing *Williams* in greater detail).

159 *See, e.g.*, 1907 Ill. Laws 75 (allowing a court "in its discretion" to permit a "delinquent child" to "be proceeded against" under adult law).

160 *See* Kent v. United States, 383 U.S. 541, 554 (1966). Some states have sharply curtailed judges' discretion. *See, e.g.*, CAL. WELF. & INST. CODE § 707(b) (West 2008 & Supp. 2009) (requiring judicial transfer if any of the listed factors are established by the record).

161 *See* ZIMRING, *supra* note 29, at 139–57 (explaining transfer schemes and the increasing use of prosecutorial and legislative transfer). Transfer schemes are byzantine, and many states combine all three approaches. *See, e.g.*, LA. CHILD. CODE ANN. arts. 305, 857, 863 (2007). Transfer is often also referred to as "certification" or "waiver." This Article uses the term "transfer" to avoid confusion with waiver of constitutional rights.

162 *See, e.g.*, State v. Behl, 564 N.W.2d 560, 566–69 (Minn. 1997). *But see* State v. Mohi, 901 P.2d 991, 995–1004 (Utah 1995) (invalidating a prosecutorial transfer scheme as violative of the Utah Constitution).

combinations of age and charged offense categorically warrant adult treatment; they also affirmed prosecutors' power to make that determination, either by choosing the charge or by choosing the court.[163] Brain science has not altered these tendencies.

A number of youth have urged post-*Roper* that developmental neuroscience shows the irrationality of nonindividualized transfer and counsels reversal of this doctrinal trend. David Garcia, for example, offered expert testimony on adolescent brain development to support his claim that New Mexico's transfer law was "a rejection of biology,"[164] a claim echoed by that of a California teenager.[165] An Illinois youth similarly argued that the transfer should be disallowed as the "same science . . . that led the Supreme Court to conclude that the incomplete brain development and resulting character attributes . . . renders the death penalty an inappropriate punishment for juveniles necessitates the conclusion that other harsh adult penalties are also inappropriate for juveniles."[166] Each of these appeals, like their pre-*Roper* predecessors, appears to have failed because of deference to the

163 *See, e.g.*, United States v. Bland, 472 F.2d 1329, 1333–38 (D.C. Cir. 1972) (rejecting challenges based on equal protection, separation of powers, and due process); State v. Cain, 381 So. 2d 1361, 1364–68 (Fla. 1980) (rejecting the same under state and federal law).

164 Child Defendant's Closing Remarks at 2, 5, State v. Garcia, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) [hereinafter *Garcia* Closing]; Reply to State's Response to Motion to Dismiss First Degree Murder and Felony Murder Charges as Unconstitutional at 5–9, *Garcia*, No. CR2005-422 (N.M. Dist. Ct. Dec. 14, 2007) [hereinafter *Garcia* Reply] (arguing that "recent scientific understanding of adolescent brain development and how that impacts behavior" creates Eighth Amendment issues and shows that statute not rationally related to purposes of punishment). The *Garcia* case is discussed further *infra* notes 187–92.

165 Petition for Review Following Denial of Petition for Writ of Habeas Corpus at 5–6, People v. Gonzales, Nos. E036344, E037793, 2005 WL 1799520 (Cal. Ct. App. Sept. 1, 2005) (asking "whether in view of the growing consensus of the medical community and mental health professionals that the teenage brain has much less control over impulsive behavior coupled with the impulsive nature of petitioner's first crime," automatic transfer and mandatory adult sentencing is cruel and unusual). Gonzales urged that the science post-dates, and calls into question, the California voters' decision to institute legislative transfer.

166 Motion to Declare Defendant's Transfer to Adult Court Unconstitutional at 7–8, 10, People v. Jones, (Ill. Cir. Ct., Cook County, Apr. 7, 2006) [hereinafter Casey Jones Motion], *available at* http://www.njdc.info/2006resourceguide/start.swf (follow link on left for "Advocacy in Adult Court" and scroll down to link for "Motion to Declare Defendant's Transfer to Adult Court Unconstitutional") ("If we can no longer put juveniles to death because of their diminished culpability, we can no longer treat them as adults when punishing them for crimes in any context."); *id.* at 16 (noting that in twelve years since Illinois Supreme Court upheld transfer scheme "significant developments have been made in understanding adolescent brain devel-

legislative scheme.[167] Only in the *Gonzales* case did the state even respond substantively to the neuroscientific argument,[168] and though several days were consumed by expert testimony, the *Garcia* trial court declined even to mention science in its ruling; it simply found that the constitutionality of legislative transfer was answered by pre-*Roper* precedent.[169]

Judicial transfer. There is no evidence that juveniles have on the basis of neuroscience either persuaded individual judges to retain juvenile-court jurisdiction; nor have they managed to overturn transfer decisions on appeal. The case of Christopher Pittman, a twelve-year-old convicted of killing his grandparents, is exemplary. Pittman argued that a juvenile court judge lacked authority to transfer him because "recent scientific data" shows that twelve-year-olds lack "capacity" to be tried as adults.[170] The South Carolina Supreme Court instead held that the "rules of statutory construction do not allow the Court to determine legislative intent based on scientific data" and noted that the statute contained no minimum age for judicial trans-

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opment and behavior"); *see also id.* at 21–22 (urging courts to reevaluate the constitutionality of transfer in light of new scientific evidence).

Adolescent brain science also was presented by amicus parties in a case successfully challenging Nevada's transfer scheme on the ground that it violated juveniles' right against self-incrimination. *See* Brief of Amicus Curiae National Juvenile Defender Center in Support of Appellants at 13–15 & n.14, *In re* William M., 196 P.3d 456 (Nev. 2008) (No. 48649); Affidavit of Marty Beyer, Ph.D, *William M.*, 196 P.3d 456 (Nev. 2008) (No. 48649). However, the court did not cite to the developmental research in overturning the scheme. *See William M.*, 196 P.3d at 460–65.

167 *See Gonzales*, 2005 WL 1799520, at *9 (rejecting challenge). It is not possible to ascertain with certainty the fate of the *Jones* case. "Casey Jones" is a pseudonym assigned by amicus counsel. However, a legal database search reveals no reported Illinois case matching the described facts; a lower court ruling that the transfer scheme is unconstitutional certainly would have been appealed by the state, as it would have overruled state supreme court precedent, and almost certainly would have been reported. The logical inference is that the challenge was denied.

168 *Gonzales*, 2005 WL 1799520, at *7 ("Regardless of whether the nature of the adolescent brain produces behavior that is more impulsive than an adult's, as defendant asserts, his conduct in this case reveals a high degree of individual culpability."); *see also* Reply to State's Response to Motion to Declare Defendant's Transfer to Adult Court Unconstitutional at 1, 11–12, *Jones*, (Ill. Cir. Ct., Cook County, June 23, 2006), *available at* http://www.njdc.info/2006resourceguide/start.swf (follow link on left for "Advocacy in Adult Court" and scroll down to link for "Reply to State's Response to Motion to Declare Defendant's Transfer to Adult Court Unconstitutional") (reflecting that State did not respond to brain-science arguments).

169 Order Denying Motion to Dismiss First Degree Murder and Felony Murder Charges as Unconstitutional at 4, *Garcia*, CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) [hereinafter *Garcia* Denial Order] (citing State v. Muniz, 74 P.3d 86 (N.M. 2003)).

170 State v. Pittman, 647 S.E.2d 144, 161 (S.C. 2007).

fer.[171] In the same vein, a Minnesota appellate court rejected a defendant's claim that a judge should have considered neuroscience when making the transfer decision, as the legislature had determined the relevant factors and had not included neuroscience among them.[172]

Thus, developmental neuroscience has to date proved no match for the strong doctrinal pull toward deference to transfer schemes and has failed materially to influence individual transfer determinations.[173]

3. Mental States

Defenders' efforts to use developmental neuroscience in the context of mental-state assessment—whether going to mens rea, mental-state defenses, or to the ability competently, knowingly, and intelligently to assert or waive constitutional rights—also have largely fallen short, primarily because of the generally "adult-like" tests of mental state by which juveniles are judged. Substantive criminal law generally is adopted wholesale by the juvenile justice system; the special attrib-

171 *Id.* at 162.

172 *In re* Welfare of A.J.F., No. A06-303, 2007 WL 92843 at *2, 4 (Minn. Ct. App. Jan. 16, 2007) (indicating that fifteen-year-old charged with first-degree murder asked that the judge be required to consider *Roper*'s "discussion of how adolescent brain development impacts culpability," but the court held that science could not alter the legislature's choices "regarding how culpability is to be viewed" for transfer purposes); *see also* Petitioner's Petition for Review from Denial of Petition for Writ of Mandate at 5–7, Gregory H. v. Superior Court, No. S158098 (Cal. Nov. 13, 2007) (describing expert testimony at transfer hearing that argued because "the last stage of brain maturity engages higher reasoning, abstract abilities, judgment, foresight and the ability to delay gratification, a 14-year-old boy is far from achieving neurological development" but noting that the juvenile was nonetheless transferred); Docket Entry of Jan. 16. 2008, *Gregory H.*, No. S158098 (Cal. Jan. 16, 2008) (denying petition for review).

In a Vermont case, defense counsel raised developmental neuroscience in an appeal from denial of "reverse waiver," a process by which juveniles initially charged as adults sometimes can be transferred to juvenile court. The appellate court remanded for a new hearing on other grounds and did not discuss the brain-based argument. *See* State v. Dixon, 967 A.2d 1114, 118–19 (Vt. 2008) (summarizing results of a psychological evaluation of the defendant); Brief of the Appellant at 33, *Dixon*, 967 A.2d 1114 (No. 07-457).

173 As in the punishment cases, there is evidence of a small countertrend. A Ninth Circuit judge dissented from a decision upholding deportation of a juvenile following his mandatory transfer to, and conviction in, adult court. The judge relied in small part on developmental science, possibly including brain science, to assert that all youth should be afforded individual judicial transfer hearings. Mendez-Alcaraz v. Gonzales, 464 F.3d 842, 849–51 (9th Cir. 2006) (Ferguson, J., dissenting) ("Both the law and the scientific literature agree that when it comes to crime, juveniles are different.").

utes of that system cluster around adjudication procedures and dispositional consequences, not standards for determining guilt.[174] Thus, the same mental-state concepts are used in juvenile and adult court.[175] More, while age clearly matters to assertion of Fourth Amendment rights and to competence determinations, courts have yet to reach any consensus over how this is so, and tend to use adult-like tests despite brief nods to the impact of youth.[176] Reliance on adult-like standards has made courts reticent to consider brain-based arguments that minors are unable (or less able) to form "specific intent," do not consider future consequences in the manner contemplated by the felony-murder doctrine, and should be measured by a different concept of "reasonableness." Such challenges often are perceived as going to the legitimacy of the rules themselves rather than their application.

Intent. In a number of homicide cases defenders have claimed that the young person, because of brain immaturity, did not consciously desire, or realize to a substantial certainty, that someone would die as a result of his actions.[177] They sometimes also argue that the young person did not consciously deliberate over whether to act, defeating any element of premeditation.[178] Such assertions were first raised pre-*Roper*, not in the courts but in the media. In a 2001 editorial following a school shooting in which fifteen-year-old Andy Williams killed two and injured thirteen, a researcher with the National Institutes of Health wrote:

> I doubt that most school shooters intend to kill, in the adult sense of permanently ending a life and paying the price for the rest of

174 *See, e.g.*, VA. CODE ANN. § 16.1-228 (2003 & Supp. 2009) (defining delinquent child as person under eighteen who commits an act designated as a crime by the penal code); Sanford J. Fox, *Responsibility in the Juvenile Court*, 11 WM. & MARY L. REV. 659, 672 (1970).

175 This is so unless the legislature has chosen to extend to minors tried in juvenile court either an infancy defense or a presumption of inability to form intent. *See, e.g.*, *In re* Gladys R., 464 P.2d 127, 133–34 (Cal. 1970); *In re* Tyvonne, 558 A.2d 661, 668 (Conn. 1989).

176 *See, e.g.*, Yarborough v. Alvarado, 541 U.S. 652, 666–67 (2004); Fare v. Michael C., 442 U.S. 707, 725–26 (1979); *see also* Lourdes M. Rosado, Note, *Minors and the Fourth Amendment: How Juvenile Status Should Invoke Different Standards for Searches and Seizures on the Street*, 71 N.Y.U. L. REV. 762 (1996) (explaining how courts have applied the Fourth Amendment to minors and arguing for a juvenile consent standard to account for adolescent's cognitive differences).

177 A first-degree murder charge typically requires such proof. WAYNE R. LAFAVE, CRIMINAL LAW § 14.2 (4th ed. 2003); *see also* MODEL PENAL CODE § 2.02(2)(a), (b) (1985) (defining "purpose" and "knowledge," which together comprise what is called specific intent).

178 Premeditation usually is defined as advance contemplation or a turning over in the mind. *See, e.g.*, Watson v. United States, 501 A.2d 791, 792–93 (D.C. 1985).

> their own lives. Such intention would require a fully developed prefrontal cortex, which could anticipate the future and rationally appreciate cause and effect. The young school shooter probably does not think about the specifics of shooting at all. The often reported lack of apparent remorse illustrates how unreal the reality is to these teenagers.
>
> This brief lesson in brain development is not meant to absolve criminal behavior or make the horrors any less unconscionable. But the shooter at Santana High, like other adolescents, needed people or institutions to prevent him from being in a potentially deadly situation where his immature brain was left to its own devices. No matter what the town or the school, if a gun is put in the control of the prefrontal cortex of a hurt and vengeful 15-year-old, and it is pointed at a human target, it will very likely go off.[179]

The editorial may have influenced Williams's defense, as shortly after the shootings he had an MRI taken of his brain.[180] Before it was examined, though, Williams pleaded guilty. He now claims that "trial counsel erred because that MRI could have been analyzed to determine whether his brain development showed a lack of maturity and impulse control," factors that purportedly would have been relevant to the "willful, deliberate, and premeditated" mens rea required on all counts.[181] As he asked in a 2007 *pro se* motion,

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179 Daniel R. Weinberger, *A Brain Too Young for Good Judgment*, N.Y. TIMES, Mar. 10, 2001, at A13; *see also* STRAUCH, *supra* note 4, at 114–15 (discussing *Williams* case).

180 Williams v. Ryan, No. 05-cv-0737, 2007 WL 925834, at *1 (S.D. Cal. Mar. 2, 2007) (holding that the defendant's claim of ineffective assistance of counsel based on unexamined MRI was exhausted for habeas purposes). Though Williams's many post-conviction filings all refer to the MRI, they nowhere explain why it was taken and why it was not examined. *See, e.g.*, Petitioner Charles Andrew Williams' Memorandum of Points and Authorities in Support of his Motion to Stay the Federal Habeas Petition to Permit Petitioner to Return to State Court to Attempt to Exhaust All Unexhausted Claims at 9, *Williams*, No. 05-cv-0737 (S.D. Cal. Mar. 2, 2007) [hereinafter *Williams* Memorandum]. Nor is such information found on a website maintained by his supporters. *See* Andy Speaks, http://www.andyspeaks.com/main.html (last visited Sept. 11, 2009).

Several years prior, fifteen-year-old Kip Kinkel, who pleaded guilty to killing his parents and two schoolmates and injuring many more at his school, introduced brain-scan evidence as mitigating evidence at his sentencing hearing. That testimony was intended to support psychiatric testimony that Kinkel was mentally ill and in need of treatment, not to show that he had a developmentally normal brain. The prosecution did not cross-examine the brain expert and the judge did not discuss that evidence at sentencing. *See* Frontline, *The Killer at Thurston High: 111 Years Without Parole*, PBS, May 2004, http://www.pbs.org/wgbh/pages/frontline/shows/kinkel/trial. It is possible that Williams's counsel initially sought the MRI because of the Kinkel case.

181 Notice of Motion and Motion to Dismiss for Writ of Habeas Corpus at 4, *Williams*, No. 05-cv-0737 (S.D. Cal. filed July 10, 2008) (internal quotation marks omit-

> The Superior Court of the United States has recently ruled teenage criminal defendants cannot be sentenced to death because their brains are not fully developed, and yet there is an unread MRI of this teenage criminal defendant's brain, taken just after shooting 15 fellow students and school personal, but no lawyer appointed had it examined, considered, or used in defense. When? Where? What Court takes this claim seriously?[182]

This claim is pending and, given the complicated habeas posture, likely will not be resolved for some time.[183] However, similar efforts to defeat evidence of specific intent to kill, or of premeditation, by recourse to brain science all have failed.

Pittman, for example, argued that "the portion of the brain that gives one the cognitive capacity to satisfactorily perform acts such as forming malice . . . is underdeveloped in a twelve-year-old."[184] The court found the argument "unconvincing given the nature of the criminal acts," pointing to evidence that the child acquired a gun, waited until his grandparents were asleep, "executed an escape plan, and concocted a false story" to mislead police.[185] As such actions by an adult would be sufficient to infer either a conscious plan to cause death or an awareness that death would (and did) result, it was considered a fortiori to allow the same inference for a child. Similarly, a Tennessee court rejected expert testimony about adolescent brain development in determining that a fifteen-year-old premeditated the killing of her grandparents.[186]

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ted); *id.* at 5 (referring to "available MRI" and complaining that trial counsel failed to investigate "his maturity and ability to exercise judgment and control his impulses which may have led to defenses based on insanity, diminished capacity and/or lack of intent").

182 *Williams*, 2007 WL 925834, at *8 (quoting motion for coram vobis). These arguments have now been echoed by Williams's habeas counsel. *See* Williams Apr. 2007 Filing, *supra* note 180, at 11–13 (asserting that MRI and other evidence as to adolescent brains show unconstitutionality of Williams's waiver of rights, guilty plea, and sentence).

183 Williams's claim is unlikely ever to provide significant guidance on the relevance of brain science to mental-state defenses, as it will be filtered through the *Strickland v. Washington*, 466 U.S. 668, 687 (1984), test for ineffectiveness of counsel—meaning that a court easily could find that the relevance of such evidence was sufficiently unclear in 2001 as to preclude a claim that counsel was neglectful in failing to pursue it.

184 State v. Pittman, 647 S.E.2d 144, 163 (S.C. 2007).

185 *Id.* ("Appellant's story was so detailed that it led law enforcement on an extensive ruse for most of the morning following his discovery.").

186 State v. Daniel, No. M2005-01211-CCA-R3, 2006 WL 3071329, at *10–11 (Tenn. Crim. App., Oct. 30, 2006) (indicating that psychiatrist testified "generally about the physical development of the parts of the brain which control judgment; but, he did

In like fashion, Garcia invoked brain science to assert that fifteen-, sixteen-, and seventeen-year-olds are so generally incapable of forming a "willful, deliberate and premeditated" mens rea as to invalidate their wholesale transfer to adult court when charged with first-degree murder, and was granted a hearing at which to present expert testimony.[187] That hearing, though, revealed that Garcia was not so much arguing that teens cannot (or do not) satisfy the legal test for specific intent as he was arguing for a different conception of the mental state morally justifying conviction of a teen for intentional murder. His own experts agreed that adolescents are capable of forming specific intent.[188] Their main point about brain immaturity was a

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not testify regarding the development of the Appellant's brain or that she, specifically, was incapable of exercising judgment" but nonetheless finding that "[r]egardless of her young age, the circumstances surrounding the shootings, both before and after, demonstrate premeditation").

187 *See* Motion to Dismiss First Degree Murder and Felony Murder Charges as Unconstitutional at 9, 13, State v. Garcia, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) [hereinafter *Garcia* Motion to Dismiss]; *see also id.* at 17 (asking to present expert testimony that brain immaturity "precludes juveniles from considering the consequences of their actions"). Three mental-state questions were at issue: juveniles' capacity to form specific intent, Garcia's capacity to do so, and whether he actually did so. *See, e.g.*, Reporter's Transcript of Apr. 26–27, 2007 at 13, *Garcia*, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) [hereinafter *Garcia* Transcript I] (stating the court's understanding that the issue "was the science behind the question of the maturation of the human brain, not David's brain, per se," that "[a]ll brains mature, basically, the same way," and that "as a class . . . the brains of juveniles are not as fully developed as an adult"). Garcia's brain-science arguments were issues of first impression. *Garcia* Reply, *supra* note 164, at 12 ("[T]he Defense has not found a New Mexico state case in which a reviewing court has directly considered the impact of *Roper* and brain development research . . . .").

188 Garcia's experts—Ruben Gur, of the University of Pennsylvania, and Marty Beyer, a developmental psychologist—testify frequently. *See Garcia* Transcript I, *supra* note 187, at 62–63, 110–11 (noting that Gur has testified in twenty to twenty-five criminal cases, and in several about adolescent brain science); *id.* at 128–30 (stating that Beyer has testified in approximately thirty-five cases); *cf.* Klein v. Nat'l R.R. Passenger Corp., No. 04-955, 2008 WL 879968, at *8 (E.D. Pa. Mar. 31, 2008) (including Gur's testimony on the juvenile brain offered by civil plaintiffs suing Amtrak for injuries suffered by teenage boys who climbed atop a parked train car).

Both submitted written reports and testified about anatomical brain immaturity. *Garcia* Transcript I, *supra* note 187, at 136 (testimony of Marty Beyer) ("[T]he behavioral immaturity that we all know about in teenagers really mirrors the anatomical immaturity . . . ."); Declaration of Ruben C. Gur, Ph.D. at 15, *Garcia*, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) (urging "presumption . . . that someone under 20 should be considered to have an underdeveloped brain," with impact on formation of mens rea); Developmental Assessment of David Garcia, Marty Beyer, Ph.D. at 5, 136, *Garcia*, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) ("[E]ven intelligent adolescents are not capable of adult decision-making in part because their brains continue

much deeper one: that though a typical teenager literally is capable of intending his actions and their consequences, his technically sufficient mental state is substantively irrational.[189] For example, an adolescent might intend the victim to die, but he lacks a meaningful conception of what it means for a person to be dead.[190] Even if true, that point is also irrelevant unless a court were willing to adopt a substantively deep concept of the applicable mens rea. The experts' secondary point was about odds: that the planning and forethought contemplated by New Mexico law is far less common in adolescents is

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to develop beyond age 18."). At the hearing Gur gave a PowerPoint presentation about adolescent brain development, concluding that a typical juvenile will, because of incomplete myelination and pruning, be less able to "make the appropriate executive decision at the time of upheaval or excitement," control aggressive impulses, and anticipate and plan for the future. *Garcia* Transcript I, *supra* note 187, at 46–48 (testimony of Gur).

Both experts conceded the ability to form specific intent. *Id.* at 64 (testimony of Gur) ("I'm not saying that juveniles are unable to form an intent."); *id.* at 3 (testimony of Beyer) (testifying that Garcia was capable of forming specific intent). A third expert testified that Garcia did not actually form such intent. *See id.* at 59 (testimony of Thomas Calvin Thompson) ("[T]he indications in the neuropsychological testing, the prolonged history of stress and depression, and the extreme high level of vulnerability of his system to emotional overload would have prevented him from the criteria for specific intent.").

189 *See Garcia* Transcript I, *supra* note 187, at 74 (testimony of Gur) (explaining that while children can and do plan, the real "question is the quality of their consideration," that is, "the extent to which they're able to premeditate in a rational fashion"); *id.* at 89, 131–32 (expressing the view that children can plan, but their quick decisions are bad ones); *id.* at 185 (testimony of Beyer) ("[T]eenagers can form intent, but . . . the way they think it through is often not rational . . . ."); *id.* at 227 (noting that Garcia's actions in obtaining gun showed ability to form intent while "not being able to think rationally"); *id.* at 258 (stating that individual assessment should focus not just on teen's intent "but also their ability to think rationally").

The State's experts agreed that adolescents are capable of forming specific intent, but applied straightforward definitions of planning and forethought. *See, e.g.*, Reporter's Transcript of May 10, 2007, at 212, *Garcia*, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) [hereinafter *Garcia* Transcript II] (testimony of Adrian Raine) (concluding that in order to convince him that teens can't "form intent and make an informed decision," intent would have to be defined other than by its ordinary meaning); *cf.* Morse, *supra* note 59, at 407 (asserting that advocates' mens rea claims necessarily must concede a "*prima facie* case for guilt" but urge that youth "are nonetheless less criminally responsible because they have insufficiently developed rationality").

190 *See Garcia* Transcript I, *supra* note 187, at 140–42 (testimony of Gur) (asserting that, in part due to "lack of development of the brain," "teenagers don't really have a concept of what it means to kill or die"); *cf. id.* at 223 (testimony of Beyer) (testifying that Garcia understood that "guns kill people" but did not anticipate death of victim).

acting impulsively, particularly in emotionally intense situations.[191] That point, even if true, also is irrelevant unless a court were willing to find that specific intent is so rare in teenagers who kill as to upset the legislative transfer scheme on its face, rather than leaving that determination in the individual instance to prosecutors (in selecting the charges) and factfinders (in determining whether adequate planning has been proven). The *Garcia* court apparently was uninterested in taking either step, as it summarily rejected both arguments.[192] As in *Pittman*, the court hewed closely to traditional mens rea definitions and deferred to legislative choices.[193]

Reasonableness. If brain-based challenges to specific intent have been unsuccessful because of the relatively undemanding prevailing conception of that mens rea, challenges going to reasonableness might fare better. Failure to foresee consequences is culpable only where such failure constitutes a gross deviation from what a reasonable person in the actor's situation would have foreseen, and the developmental attributes of one's age are part of one's "situation."[194] Thus,

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191 *See, e.g., id.* at 73–74, 89 (testimony of Gur) (arguing that conscious planning and consideration of consequences are unlikely when teen experiencing "emotional upheaval").

192 *See Garcia* Denial Order, *supra* note 169, at 2–4.

193 A similar result obtained in a case in which a ten-year-old unsuccessfully argued that he was unable to form specific intent to commit "mayhem" and aggravated assault. His appellate counsel relied in part "on recent scientific studies that purport to show that brain development plays a crucial role in a child's ability to understand the consequences of his actions." Commonwealth v. Ogden O., 864 N.E.2d 13, 20 n.8 (Mass. 2007); *see also id.* at 19 n.6, 20 n.8 (rejecting "evidence that children between the ages of seven and fourteen years are incapable of committing criminal acts because of insufficient brain development," out of "'respect for the legislative process'" and because the data, which was not part of the record, did not refer specifically to the defendant (quoting Mass. Fed'n of Teachers v. Bd. Of Educ., 767 N.E.2d 549, 558 (Mass. 2002))).

In an additional case, a fifteen-year-old convicted of shooting two students at his high school appealed the trial court's rejection of his insanity plea. On a post-*Roper* appeal he argued that due process requires that teens be judged by not by the M'Naghten test for insanity but by the "irresistible impulse" test, "because adolescents' brains are less developed than adults' brains in regions related to impulse control, risk assessment, and moral reasoning" and therefore they "may understand their actions or know that they are wrong, but still be unable to control [their] behavior." State v. McLaughlin, 725 N.W.2d 703, 712 (Minn. 2007) (internal quotation marks omitted) (alteration in original). As the claim was raised for the first time on appeal the Minnesota Supreme Court declined to reach it. *See id.* at 713.

194 MODEL PENAL CODE § 2.02(2)(c) (1985) ("A person acts recklessly . . . when he consciously disregards a substantial and unjustifiable risk . . . [and that] disregard involves a gross deviation from the standard of conduct that a law-abiding person would observe in the actor's situation."); *id.* § 2.02(2)(d) ("A person acts negligently

doctrinal barriers to consideration of developmental factors are lower in this context.[195] Notwithstanding this relatively open space, however, adolescent brain science generally has failed to persuade.

Courts' first rationale is that the legislature has allowed them less interpretive room than advocates urge. *State v. Heinemann*[196] makes this point. Gabriel Heinemann asked that the adult-court jury considering his duress defense be instructed on attributes of the "reasonable adolescent"; while the argued instruction would not have mentioned brain science, its content would have reflected insights drawn in part from that science.[197] Dismissing as irrelevant "literature about the developing adolescent mind," the trial court determined that whether a person of "reasonable firmness" in Heinemann's position would have been unable to resist a threat was "a community objective standard."[198] On appeal Heinemann and his amici again presented developmental literature, both psychological and neuroscientific.[199] The

. . . when he should be aware of a substantial and unjustifiable risk . . . [and that] failure to perceive it . . . involves a gross deviation from the standard of care that a reasonable person would observe in the actor's situation.").

195 State and federal law generally allows courts to consider the impact of youth and immaturity, at least to some degree, in such determinations. *Cf.* Fare v. Michael C., 442 U.S. 707, 725 (1979) (noting need for flexibility to consider "special concerns that are present when young persons, often with limited experience and education and with immature judgment, are involved").

196 920 A.2d 278 (Conn. 2007).

197 *Id.* at 284–89. Heinemann, sixteen years old, claimed he had been frightened into submission by two older, larger, and stronger teenagers, one of whom had a gang connection and both of whom were armed. *Id.* at 285–87. Under Connecticut law duress has both a subjective component—the defendant must have been sincerely afraid that he would be physically harmed—and an objective component—the threat must be such that "a person of reasonable firmness in his situation would have been unable to resist." CONN. GEN. STAT. ANN. § 53a-14 (West 2007). The trial court refused to instruct the jury to consider age-typical psychological attributes when determining the reasonableness of his response to the purported duress. *Heinemann*, 920 A.2d at 288–89, 294 (refusing instruction that age is relevant to "reasonable, moral firmness" and "moral temperament" aspects of legal test for duress, and instructing jury that Heinemann's age was a "stark tangible factor," like size and weight, that it should consider only in differentiating him from the other defendants).

198 *Heinemann*, 920 A.2d at 288, 290 & n.15 (rejecting relevance of "recent legal debate" over adolescent mind).

199 *Id.* at 295 (repeating the defense's argument that the court should "recognize the differences between a juvenile and an adult in maturity, sense of responsibility, vulnerability, and personality traits, which make it more difficult for adolescents to resist pressures because of their limited decision-making capacity[,] . . . their susceptibility to outside influences," and their different evaluation of risks); *see also id.* at 296 n.19 (detailing developmental arguments, including those pertaining to recent "research on brain development," made by amici).

Connecticut Supreme Court "acknowledge[d] that juveniles often have more immature decision-making capability and recognize[d] the literature supporting the notion that juveniles are more vulnerable to all sorts of pressure, including, but not limited to, duress."[200] However, it believed itself bound by the legislature's decision to treat sixteen-year-olds as adults, including for purposes of assessing mental states. Taken to "its logical conclusion," the court held, Heinemann's argument would "require this Court to rewrite the entire Penal Code, crimes, and defenses, to necessitate consideration of the age of young offenders for the ultimate purpose of defining their culpability."[201] Developmental science was not sufficient to persuade the court to characterize as "'clearly irrational and unreasonable'" the legislature's decision to confine its "appreciation of the different mental abilities and susceptibilities of younger persons" to those under sixteen, and to express that appreciation not through differential definition of reasonableness but through maintenance of a separate juvenile justice system with distinct procedural attributes and sentencing outcomes.[202]

A further rationale, previously noted in the JLWOP cases, is that a tutorial in brain science adds little or nothing to factfinders' existing knowledge. A Minnesota appellate court reached this conclusion in the context of a defense-of-others claim in adult court.[203] Relying (like the *Heinemann* court) on the legislative scheme for transfer, it refused to order instruction on the "reasonable adolescent" standard. It also approved exclusion of defendant's proffered expert testimony about "the physiological differences between adolescent and adult brains," which he claimed would explain why his perceptions and actions were reasonable.[204] Such testimony, the court held, would not

200 *Id.* at 296.

201 *Id.* at 297 & n.20 (arguing that the same result would obtain even if court ignored ramifications of scientific evidence, for unless defendant could show a "'*gross and verifiable*'" mental disability he is "confined to the normative function of duress" (quoting MODEL PENAL CODE § 2.09, cmt. 2 (1985))); *cf. In re* A.C.L., No. A06-1489, 2007 WL 447080, at *3–4 (Minn. Ct. App. Feb. 13, 2007) (refusing to disturb juvenile-court assessment that "impulsive" and "unplanned" actions, part of defendant's imperfect self-defense claim, were "typical" of an adolescent, though not mentioning or relying on brain science).

202 *Heinemann*, 920 A.2d at 297 (quoting State v. Dupree, 495 A.2d 691, 697 (Conn. 1985)). The court noted a then-pending bill to extend that "appreciation" to sixteen- and seventeen-year-olds; it later became law. 2007 Conn. Acts 96 (Spec. Sess.).

203 State v. Alford, No. A07-1025, 2008 WL 4006657, at *5–6 (Minn. Ct. App. Sept. 2, 2008) (stating that seventeen-year-old defendant claimed to have acted reasonably in defending brother against assault by housemate).

204 *Id.* at *5.

assist the jury, as "every parent and person who has gone through adolescence is familiar with and can understand the immaturity and impulsive responses of adolescents."[205] Thus, courts that have considered brain-based arguments going to reasonableness have found them irrelevant, both as a matter of law and a matter of fact.

Felony murder. Courts also have turned aside efforts to invalidate application to juveniles of the felony murder doctrine. Under that doctrine, the state generally need not prove intent to kill if it is able to prove intent to commit the predicate felony and a causal link to the death.[206] Like reasonableness, the doctrine necessarily relies on group-level assumptions about what people do and should foresee; the doctrinal space is similarly somewhat open. Therefore, J.B., an Ohio thirteen-year-old convicted of the felony murder of his infant brother,[207] argued before the U.S. Supreme Court that it is unreasonable to assume that minors, particularly very young ones, would or should foresee a risk of death when committing predicate felonies.[208] Garcia similarly claimed that brain science showed that teens generally lack the level of forethought justifying that doctrine.[209] One of his experts testified that anatomical brain immaturity contributes to

205 *Id.* at *6 (noting further that trial court had allowed psychiatrist to testify about defendant's background, state of mind, and effects of drugs and alcohol; even if "fully informed about the physiology of adolescents' brains" jurors would have found actions unreasonable).

206 *See* JOSHUA DRESSLER, UNDERSTANDING CRIMINAL LAW § 31.06[B], at 523–26 (5th ed. 2009). Even as applied to adults the doctrine is unpopular among commentators. *See* State v. Ortega, 817 P.2d 1196, 1201 (N.M. 1991) ("'Few legal doctrines have been as maligned and yet have shown as great a resiliency as the felony-murder rule.'" (quoting Nelson E. Roth & Scott E. Sundby, *The Felony-Murder Rub: A Doctrine at Constitutional Crossroads*, 70 CORNELL L. REV. 446, 446 (1985))).

207 *In re* J.B., No. CA2004-09-226, 2005 WL 3610482 (Ohio Ct. App. Dec. 30, 2005), *appeal denied*, 847 N.E.2d 1226 (Ohio 2006), *reconsideration denied*, 852 N.E.2d 191 (Ohio 2006), *denial of post-conviction relief aff'd*, No. CA2005-06-176, 2006 WL 1493276 (Ohio Ct. App. May 30, 2006).

208 Petition for Writ of Certiorari at 25–29, J.B. v. Ohio, 549 U.S. 1246 (2006) (No. 06-7611) [hereinafter *J.B.* Certiorari Petition] (citing brain science to "highlight[ ] the unfairness of applying the felony-murder doctrine to cases involving children"). This argument, first raised during state-court proceedings, was not addressed by the Ohio courts. *See* Memorandum in Support of Jurisdiction of Amicus Curiae Justice for Children Project at 13–15, *In re* Matter of J.B., No. 06-0339 (Ohio Feb. 13, 2006).

209 *Garcia* Reply, *supra* note 164, at 15–19, 25 (arguing that "brain science relied upon in the *Roper* decision[ ] clearly demonstrates that proof of mens rea for felony murder would be highly problematic . . . as a matter of law," as "a child cannot understand and appreciate the magnitude, nature, and consequences of risks" and teens cannot "intend the consequences of their acts"). New Mexico's felony murder provision is unusually stringent; it requires both intent to commit an inherently dangerous felony and independent "proof that the defendant *intended* to kill, [or] . . . knew that

teens' "difficulty in anticipating the consequences of their actions" and in seeing either "the wors[t] thing that could come from their actions" or "that there's more than one choice."[210]

Though these assertions, if true, would undermine the felony murder doctrine, courts have stuck by it, relying (in a now-familiar pattern) on the legislatures' choices to apply the same responsibility standards to adults and juveniles. The *Garcia* court summarily rejected the facial challenge.[211] Though the facts in *J.B.* were quite sympathetic—the boy had been left home alone in charge of four younger siblings and apparently did not intend his brother's injuries or death[212]—and the predicate showing required of the state quite low—as it had only to prove that J.B. "recklessly abused" his brother[213]—the state courts rejected the challenge without mention of the science, and the Supreme Court denied certiorari.[214]

Ability to assert or waive rights. Few courts have been directly presented with neuroscientific claims going to minors' competence to waive rights or to face prosecution. In one such case, a sixteen-year-old challenged Colorado's rule dispensing with a parental-presence requirement for interrogations of out-of-state runaways, arguing unsuccessfully that the rule ought to be judged by the strict scrutiny standard because juveniles' undeveloped brains render them a sus-

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his actions created a strong probability of death or great bodily harm." Ortega, 817 P.2d at 1205 ("An unintentional or accidental killing will not suffice.").

210 *Garcia* Transcript I, *supra* note 187, at 170–72 (testimony of Beyer) (claiming that teens frequently "don't think about the consequences of their actions," showing "terrible shortsightedness" though they may see their errors in "hindsight").

211 Garcia subsequently pleaded guilty. Docket Entry of July 9, 2007, State v. Garcia, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) (listing change of plea to guilty). The court accepted Garcia's plea and imposed a sentence of twenty-eight years in prison and five years of parole. *See* Docket Entry of Dec. 14, 2007, *Garcia*, No. CR 2005-422 (N.M. Dist. Ct. Dec. 14, 2007) (reporting sentence, including 27 years and 364 days in prison).

212 *J.B.* Certiorari Petition, *supra* note 208, at 15–16, 25. J.B. testified that he had accidentally hurt the baby, J.R.; lost his temper when J.R. would not stop crying; and then injured him further. *J.B.*, 2005 WL 3610482, at *1. He and another sibling attempted CPR and tried to call for help, but their mother had removed the phone. *Id.* They lay J.R. in a blanket and prayed next to him until their mother came home. *Id.* J.R. died at the hospital. *Id.*

213 *J.B.* 2005 WL 3610482, at *13. Ohio—like most U.S. jurisdictions—requires only proof of the mens rea for the predicate felony, and many predicate felonies require only a reckless or negligent mens rea as to consequences. *See* J.B. Certiorari Petition, *supra* note 208, at 25–29.

214 J.B. v. Ohio, 549 U.S. 1246 (2007) (No. 06-7611) .

pect class.[215] In a small handful of other cases, defendants and amici have raised brain science as one reason why evidence—statements to police or the fruits of a consent search—should have been suppressed, and courts have simply ignored or rejected the assertion as insufficiently developed.[216]

As in the sentencing context, though, there is a small countertrend. In one case, the Wisconsin Supreme Court (nowhere relying on neuroscience) used the "totality-of-the-circumstances" test to conclude that a fourteen-year-old's written confession was involuntary.[217] Chief Justice Abrahamson wrote a lone concurrence in which she

215 People v. Blankenship, 119 P.3d 552, 555 (Colo. App. 2005) (rejecting defendant's argument that "juveniles lack the cognitive ability to make a knowing election under *Miranda*" and "occupy a special class of persons to whom additional constitutional protection ought to be afforded because '[t]he scientific studies on the cognitive abilities of adolescents do not differentiate between adolescents who are runaways and those who are not'"); *see also* Blankenship v. Estep, No. 05-cv-02066, 2008 WL 4964712, at *1, *4 (D. Colo. Nov. 18, 2008) (accepting recommendation of denial of habeas petition and citing that portion of the state court decision); Gilbert v. Merchant, 488 F.3d 780, 793–95 (7th Cir. 2007) (rejecting habeas challenge to failure to suppress statement without parental presence, despite citation to academic article referencing brain development) (citing Kenneth J. King, *Waving Childhood Goodbye: How Juvenile Courts Fail to Protect Children from Unknowing, Unintelligent, and Involuntary Waivers of* Miranda *Rights*, 2006 Wis. L. Rev. 431, 432–44).

216 *See, e.g.*, State v. Pittman, 647 S.E.2d 144, 166 (S.C. 2007) ("Appellant has presented no evidence, other than his age, supporting his claim that his confession was involuntary. Appellant instead relies exclusively on abstract scientific data and rhetorical questions for his argument. This evidence is not probative of coercion."); *see also* Williams Memorandum, *supra* note 180, at 11–14 (challenging waiver of *Miranda* and guilty plea).

In another case, a coalition of advocates and scholars submitted an amicus brief relying, in part, on developmental neuroscience to urge the Massachusetts Supreme Court to suppress evidence and statements obtained from a fourteen-year-old. *See* Brief of the Juvenile Law Ctr. et al. as Amici Curiae at 39–41, Commonwealth v. Guthrie G., 869 N.E.2d 585 (Mass. 2007) (No. SJC-090805). The court did not mention that research when it ruled the search and interrogation lawful. *See Guthrie G.*, 869 N.E.2d at 586. The Juvenile Law Center also has made a modest brain-science argument in the pending military-tribunal case of Omar Khadr; that case involves a number of other issues (like the military commissions' jurisdiction over minors) but also involves the voluntariness of Khadr's statements to military interrogators. *See* Amicus Brief Filed by Marsha Levick on Behalf of the Juvenile Law Center at 16 n.8, United States v. Khadr, No. 07-001 (Pa. Jan. 18, 2008), *available at* http://www.jlc.org/files/briefs/OK%20BRIEF.Jan.18.FINAL.pdf.

217 *In re* Jerrell C.J., 699 N.W.2d 110, 139–40 (Wis. 2005) (applying test derived from *Fare v. Michael C.*, 442 U.S. 707 (1979), and citing Jerrell's age, education, and low intelligence, the questioning tactics used by the police, and the fact that his parents were excluded). The court used its supervisory power to require that custodial interrogation of juveniles be electronically recorded. *Id.* at 122–23.

asserted eight reasons why she would go further and "adopt a per se rule, excluding in-custody admissions from any child under the age of 16 who has not been given the opportunity to consult with a parent or interested adult"; reason number three was that "[e]merging studies demonstrate that the area of the brain governing decision making and the weighing of risks and rewards continues to develop into the late teens and the early twenties."[218]

In addition, at least one competence challenge succeeded in part because of neuroscience. A California appellate court ordered competency hearings for two young boys, eleven and twelve, holding that simple "developmental immaturity" (rather than a mental or cognitive abnormality) might provide a basis for an incompetence finding.[219] While the court relied primarily on psychological findings, it—unlike the trial court—also credited expert testimony about the brain immaturity of very young adolescents.[220] In each of these cases the role of brain science appears to have been small, but that it was mentioned as one of many reasons to grant a juvenile defendant relief is noteworthy.

* * * *

As this Section has shown, the impact of adolescent brain science on juvenile justice has been strongly cabined by the extrinsic reality of

218 *Id.* at 135 & n.46 (Abrahamson, J., concurring). Amicus parties had brought the brain science research to the court's attention. *See* Nonparty Brief of the Children and Family Justice Center at Northwestern University School of Law's Bluhm Legal Clinic et al. at 1, 4 & n.2, *Jerrell C.J.*, 699 N.W.2d 110 (No. 02-3423); *see also In re* J.T., 851 N.E.2d 1, 25 (Ill. 2006) (Freeman, J., dissenting) (asserting that juvenile's waiver of appeal was invalid, citing, inter alia, "[s]cientific and sociological studies" language of *Roper*); *cf.* State *ex rel.* P.M.P., 975 A.2d 441, 447–48 (N.J. 2009) (determining that filing of juvenile petition is "critical stage" of proceedings sufficient to trigger right to counsel that is nonwaivable unless counsel is present, but explicitly declining to engage with amicus parties' brain-science arguments because question was answered by statute).

219 Timothy J. v. Superior Court, 58 Cal. Rptr. 3d 746, 754 (Ct. App. 2007).

220 *Id.* at 754, 755 n.12 ("Dr. Edwards testified that minors are different from adults because their brains are still developing and as myelination occurs during puberty, the minor develops the ability to think logically and abstractly . . . . [B]ecause of his age, Dante's brain has not fully developed and he was unable to think in those ways. Their conclusions are supported by the literature, which indicates that there is a relationship between age and competency to stand trial and that an adolescent's cognitive, psychological, social, and moral development has a significant biological basis."); *id.* at 754 n.12 ("[T]he frontal lobes oversee high-level cognitive tasks such as hypothetical thinking, logical reasoning, long-range planning, and complex decision making. During puberty, that area of the brain matures as the myelination process takes place.").

legal doctrine.[221] Though that science has been positively received by a small number of courts and judges, usually in the context of sentencing, in no instance has it been outcome-determinative. Courts generally perceive it either as proving nothing new or as raising a challenge to the rules themselves, rather than informing an inquiry properly falling within the confines of the rules.[222] While they sometimes are "troubled by" the rules and follow them "reluctantly,"[223] courts generally do believe themselves to be bound to them.

Doctrine can, of course, change and therefore represents a soft target. But in this area of law it is not very soft. Because the above-described doctrinal forces are so entrenched and of such broad applicability within criminal law, adolescent brain science is inadequate to provoke deep change, at least within the courts.[224]

B. Scientific Limitations

The previous Section delineated the many doctrinal hurdles that have largely hamstrung adolescent brain science in the courts. Some of those hurdles say far less about the merits of adolescent brain science than they do about contemporary trends generally disfavoring both juvenile claims and judicial oversight of legislatures' criminal justice policies. However, the challenge for brain science goes deeper than doctrine. This Section demonstrates limitations that inhere in the science itself, limitations that show some the courts' general reticence sometimes to be well placed.

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221 *See* Slobogin & Fondacaro, *supra* note 98 (manuscript at 32) (noting that teens' "lack of maturity does nothing to mitigate their culpability under criminal law doctrine as it exists today").

222 *See, e.g.*, Transcript of Oral Argument at 26–27, Gall v. United States, 552 U.S. 38 (2007) (No. 06-7949) (question of Souter, J.) (arguing that defendant's assertions about immaturity, if true, "should be accepted in every case," because "the brain is less developed in the case of everyone under a certain age" and arguing that "that amounts, in effect, to a rejection of the policy for a certain swath of individuals, relatively young individuals, for whom the judge is saying age is relevant, the policy says age is not").

223 People v. Pratcher, No. A117122, 2009 WL 2332183, at *44 (Cal. Ct. App. July 30, 2009); *see also* State v. Allen, 958 A.2d 1214, 1236 (Conn. 2008) (commenting that JLWOP raises "deeply troubling questions" but stating that "the wisdom of this sentencing scheme remains with the legislature").

224 These difficulties are not unique to young defendants; mentally retarded persons have to date been similarly unable to leverage *Atkins* into greater judicial relief. *See* Barkow, *supra* note 132, at 1161–62.

1. Individual Differences

The most significant current limitation of developmental neuroscience is its inability to inform individual assessment. Imaging studies that show group trends in structural maturity—such as relative levels of myelination in prefrontal cortex—do not show that all individuals in the group perfectly reflect the trend.[225] Normal brains follow a unique developmental path bounded roughly by the general trajectory; that is, while all humans will pass through the same basic stages of structural maturation at more or less the same stages of life, the precise timing and manner in which they do so will vary.[226] Moreover, such variation cannot be detected or interpreted in any legally meaningful way. Neither structural nor functional imaging can determine whether any given individual has a "mature brain" in any respect, though imaging might reveal gross pathology.[227] Researchers therefore consistently agree that developmental neuroscience cannot at present generate reliable predictions or findings about an individual's behavioral maturity.[228] Courts thus have a strong basis for deeming brain science irrelevant to many highly individualized claims, such as whether a defendant was able to form specific intent.

Indeed, the cases reflect the difficulties posed by individual variation. Legal decisionmakers display incredulity, even annoyance, when general lessons about the adolescent brain appear to conflict with evidence about the individual juvenile.[229] One particularly vivid account

225 Casey et al., *supra* note 28, at 119–21; Morse, *supra* note 59, at 403–04, 404 n.4.

226 *See* Steinberg & Schwartz, *supra* note 1, at 24 ("Within any given individual, the developmental timetable of different aspects of maturation may vary markedly . . . . [D]evelopment rarely follows a straight line during adolescence—periods of progress often alternate with periods of regression. . . . Variability between individuals is still more important . . . ."). The problem of individual variation is present in all biological research. *See, e.g.*, Steven Pinker, *My Genome, My Self*, N.Y. TIMES MAG., Jan. 11, 2009, at 24, 28–29 (asserting that though "a substantial fraction of the variation among individuals . . . can be linked to variation in their genes . . . no one knows what the nongenetic causes of individuality are").

227 *See* Bruce Bower, *Teen Brains on Trial*, SCI. NEWS, May 28, 2004, at 299, 299 ("There's no way to say whether . . . an individual 17-year-old possesses a fully mature brain."); Gur, *supra* note 119, at 15 (agreeing with that idea).

228 *See Hearing on Adolescent Brain Development and Juvenile Justice*, *supra* note 10, at 4 (testimony of Woolard); Baird, *supra* note 39, at 121; Henderson, *supra* note 7, at 5 ("[S]cience has not progressed to the point where an individual adolescent's brain scan can be used to back up any one of these propositions in an individual case."); *see also* Brown & Murphy, *supra* note 36 (manuscript at 27) (noting that individual differences are a troubling issue for neuroscience and criminal law generally).

229 *See* People v. Gonzales, Nos. E036344, E037793, 2005 WL 1799520, at *7 (Cal. Ct. App. July 29, 2005); State v. Pittman, 647 S.E.2d 144, 154–55 (S.C. 2007); *see also* People v. Clark, 869 N.E.2d 1019, 1040 (Ill. App. Ct. 2007), *appeal denied*, 875 N.E.2d

of that phenomenon was offered by a Delaware judge who presided over a juvenile capital case while *Roper* was pending.[230] In a pretrial hearing, Michael Jones presented the testimony of Ruben Gur "that juveniles are less criminally culpable than adults because the area of their brains controlling foresight, goal setting, and ability to plan are not yet fully developed."[231] Gur later offered such testimony at trial, alongside the testimony of one Dr. Ragland, a psychologist who had examined Jones. Recounts the court:

> Dr. Ragland discovered that Jones is an exceptionally gifted planner. Dr. Ragland testified that Jones' scores regarding planning and ability to foresee consequences were "off the charts," and were, indeed, higher than any he had ever seen. This admission, which Dr. Ragland repeated *ad nauseum*, annihilated Jones' only viable defense: that, as a juvenile, he was too young to reasonably calculate the possible outcomes of his murderous rampage, and to plan accordingly. It also eliminated another proposed mitigating factor: that a sentence of life imprisonment would ensure that Jones would never again threaten society. The State used Dr. Ragland's testimony to suggest that Jones would use his exceptional gift for planning to formulate an escape, endangering corrections officers and the public at large. . . .
>
> When Dr. Gur took the stand as the next defense witness, explaining the complicated science of brain development and its nexus to planning ability, the jury appeared disinterested. Their courtroom demeanor, as well as their sentencing recommendation, made it clear that the jury viewed the medical evidence as mere "psychobabble" meant to mislead them into excusing an inexcusable crime. This was despite the fact that Dr. Gur is a superb witness: engaging, charismatic, highly expert, and convincing. There simply was no way for him to salvage the train wreck . . . of the defense case.[232]

Similarly, in *Garcia* the state was able to rebut the notion that anatomical immaturity necessarily manifests itself in a lack of meaningful appreciation of death by showing that Garcia himself had such

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1116 (Ill. 2007) (overruling, in part, the sentencing court, which had found that testimony as to Clark's "mature and respectful" nature "'really destroy[ed] any far fetched argument that he had a frontal lobe that wasn't developed'").

230 *See* State v. Jones, No. 9911016309, 2005 WL 950122 (Del. Super. Ct. Apr. 10, 2005) (denying motion for new trial). The many opinions in *Jones* reveal a high level of acrimony between the trial judge and defense counsel. The context of extreme antipathy likely colors the judge's description. However, given the jury's vote for death there is no reason to question its basic accuracy.

231 *Jones*, 2005 WL 950122, at *1.

232 *Id.* at *4–6.

appreciation; he was deeply affected by the recent death of his grandmother and frequently worried that his gravely ill mother would die.[233] The *Gonzales* court, too, remarked that "[r]egardless of whether the nature of the adolescent brain produces behavior that is more impulsive than an adult's . . . [Gonzales's] conduct in this case reveals a high degree of individual culpability."[234] Neuroscience may provide marginal support for categorically limiting the sanctions that may be imposed on juveniles,[235] but it has little to offer in assessing the mental state, capacity for rehabilitation, or other law-relevant attributes of any given juvenile.

2. Structure v. Behavior

A related difficulty stems from the reality that structural and functional differences between individual brains may not correspond with predictable or discernable differences in behavior. Just as scientists cannot look at an individual teen's brain and conclude that she has a particular level of behavioral maturity, observers cannot look at a teen's behavior and deduce the structural or functional maturity of her brain.[236] This is not an issue only for individual determinations, for even at the group level there are few data demonstrating a clear

233 *Garcia* I Transcript, *supra* note 187, at 225 (testimony of Beyer) (answering "yes" when asked if Garcia "comprehended death really well").

234 *Gonzales*, 2005 WL 1799520, at *7; *see also* People v. Diaz, No. F052637, 2008 WL 5273910, at *7–8 (Cal. Ct. App. Dec. 22, 2008) (affirming seventy-five-to-life sentence for seventeen-year-old convicted of attempted murders); *Pittman*, 647 S.E.2d at 163 ("The specific factual evidence in this case stands in stark contrast to the general nature of the scientific evidence submitted by Appellant."). The *Diaz* court affirmed the sentence despite an amicus briefing with a neurodevelopmental argument. *See* Brief of Amicus Curiae Juvenile Law Center in Support of Defendant-Appellant, *Diaz*, No. F052637 (Cal. Ct. App. Mar. 19, 2008), *available at* http://www.jlc.org/files/briefs/California_v_Diaz.pdf.

235 *Cf.* Emens, *supra* note 58, at 61, 88–89 (arguing that a categorical prophylactic rule against juvenile execution is justifiable if case-by-case assessment of maturity and culpability creates undue risk of irrational, discriminatory decisions).

236 Experts sometimes fall into this trap. For example, in *Garcia*, Dr. Gur, asked to explain the Columbine school shooters' extensive planning, replied that the planning and the crime itself were "a good illustration of failure of myelination." *Garcia* Transcript I, *supra* note 187, at 92–93 (testimony of Gur). Such an argument is circular, in that any bad act by a juvenile can be characterized as evidence of defective brain processes. *Cf.* Baird, *supra* note 39, at 118 (asserting that "there are some criminals who have very functional brains" but offend because of other factors, such as "deprived backgrounds"). Conversely, a military prosecutor sought (unsuccessfully) to elicit expert testimony that Omar Khadr's allegedly deliberate actions likely reflected brain maturity. *See* Steinberg, *supra* note 8 (manuscript at 8–9).

link between structural immaturity and immature behavior.[237] The structure-behavior hypothesis is a strong one, as brain attributes often correlate with specific behaviors, and a significant developmental stage is highly likely to manifest in behavior.[238] Developmental psychology provides a picture of the attitudes and behaviors that typify adolescents; neuroscience provides a picture of the brain maturation processes that typify adolescence; and the latter can be interpreted in such a way as to provide a plausible, partial explanation for the former.[239] But though it is highly plausible that "[a]dolescents' behavioral immaturity mirrors the anatomical immaturity of their brains," science has not determined the nature or extent of that mirroring.[240]

Advocates, commentators, and defenders unnecessarily overstate the case when they claim that imaging studies explain adolescent behavior, let alone any given adolescent's behavior. Courts also have a basis for believing neural explanations to be less probative than behavioral ones.[241] The Supreme Court displayed that defensible per-

237 *See, e.g.*, Jay N. Giedd, *Structural Magnetic Resonance Imaging of the Adolescent Brain*, 1021 ANNALS N.Y. ACAD. SCI. 77, 83 (2004); Spear, *supra* note 34, at 26 ("What is clear at this early point . . . is that the brain undergoes considerable sculpting and remodeling during adolescence. What remains a challenge is to detail the extent of this restructuring, its functional ramifications, and the opportunities and vulnerabilities provided by this unique transition for the adolescent.").

238 *See* Casey et al., *supra* note 28, at 104 (detailing efforts to determine extent to which brain development "parallel[s] behavioral and cognitive development," but warning against "common trap" of claiming "causality between coincidental changes in brain and behavioral development"); Elizabeth A. Phelps & Laura A. Thomas, *Race, Behavior, and the Brain: The Role of Neuroimaging in Understanding Complex Social Behaviors*, 24 POL. PSYCHOL. 747, 755 (2003) (explaining that though complex behavior is "mapped" onto the brain, there is no "one-to-one correspondence between a behavior and a brain structure"). *But see* STRAUCH, *supra* note 4, at 21 (asserting that it "can't be just a coincidence" that most dramatic stages of behavioral change coincide with most dramatic stages of brain remodeling).

239 *See, e.g.*, Casey et al., *supra* note 36, at 111 (positing "biologically plausible model of the neural mechanisms underlying . . . changes in behavior"); Morse, *supra* note 59, at 409 ("At most, the neuroscientific evidence provides a partial causal explanation of why the observed behavioral differences exist and thus some further evidence of the validity of the behavioral differences.").

240 AMA Brief, *supra* note 76, at 10; *see also Garcia* Transcript II, *supra* note 189, at 208–10 (testimony of Raine) (taking issue not with the defense's description of adolescent brain maturation but with the argued behavioral and legal implications); *id.* at 77–79 (testimony of Edward Siegal) (conceding accuracy of testimony about structural brain development but questioning such development's "functional impact"); Aronson, *supra* note 2, at 132 (noting AMA's "interpretative leap" in their brief).

241 *See* Phelps & Thomas, *supra* note 238, at 748 ("Although brain science can inform our understanding of complex human behaviors, it cannot help us predict human behavior with any more certainty than can be derived from examining behav-

spective in *Roper* by relying overtly on historical beliefs and legal precedent rooted in direct experience with teenagers' behavior—about which "any parent knows"—and in the behavior-based findings of developmental psychology.[242]

3. Relative Deficiency

Even if one credits the strongest hypotheses about the behavioral impact of brain immaturity, that impact cannot automatically claim legal significance. Psychological studies show that adolescents are consistently less able than adults to implement fast, appropriate, and mature responses to environmental challenges; neuroscience suggests that these relative deficiencies are partly attributable not to bad character but to biological constraints attending developmental processes.[243] But relative deficiency—for example, in impulse control—does not establish that the deficiency is legally meaningful or that any individual failure of control is excusable. It instead implies that, compared to a similar failure in an adult, it is less blameworthy to the extent that its avoidance would have required more effort, through no fault of the child's own.[244] Relative deficiencies do not necessarily take juveniles below a legal threshold but may instead show that they exceed it by a lower margin.[245] Where to set that threshold relative to juvenile deficits is, at its core, a moral and legal determination, not a scientific one.

Unfortunately, defenders and experts often treat the legal significance of the science as a given; indeed, they sometimes bypass the relative-deficiency point altogether and devolve into hard biological determinism.[246] They sometimes argue, for example, that because of

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ior itself."). Behavioral developmental science suffers from many of the same limitations this Section describes. It does not, however, suffer from all of them, and always will bear more direct relation to juvenile justice policy than will neuroscience. *See infra* note 313.

242 Roper v. Simmons, 543 U.S. 551, 569 (2005).

243 Beatriz Luna & John A. Sweeney, *The Emergence of Collaborative Brain Function: fMRI Studies of the Development of Response Inhibition*, 1021 ANNALS N.Y. ACAD. SCI. 296, 302–04 (2004).

244 *See* Baird, *supra* note 39, at 111 (citing, inter alia, B.J. Casey et al., *Clinical, Imaging, Lesion, and Genetic Approaches Toward a Model of Cognitive Control*, 40 DEVELOPMENTAL PSYCHOBIOLOGY 237 (2001); Sarah Durston et al., *A Neural Basis for the Development of Inhibitory Control*, 5 DEVELOPMENTAL SCI. F9 (2002)) (noting that "younger individuals need to recruit greater neural resources to accomplish adult-like behavior").

245 *See* Aronson, *supra* note 2, at 138; Morse, *supra* note 59, at 409.

246 *See* Pinker, *supra* note 226, at 26–27 (describing "increasingly concrete" trend toward "essentialism," though cautioning that the "scare word 'determinism'" should

their immature brains, adolescents *can't* make good decisions under stress, control their emotions, suppress violent impulses, foresee consequences, or defy antisocial peers.[247] The cases reveal that legal decisionmakers are, by and large, unprepared to accept flat assertions of inability. Such assertions conflict with everyday observations (and, often, record evidence) that most teenagers make good choices most of the time and that offenders, too, make socially beneficial, self-protective, or strategic choices, sometimes within the context of the offense behavior itself.[248] The prosecutor in *Garcia*, for example, noted that Garcia had previously threatened his girlfriend with a gun but had not shot her, something for which his experts had little explanation except that at one moment he was able to exert self-control and at another he was not.[249] Such evidence might be contextualized by explaining that juveniles' capacity for self-control is less stable than adults', but that is a relative-deficiency point that may not be legally meaningful. Courts should not be expected to assume the legal relevance of relative deficiency; that relevance must be directly and adequately defended.

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not get in the way "of learning more about the biological contributors to behaviors and propensities").

247 *See, e.g.*, *Hearing on SB 513*, *supra* note 73, at 16–17 (testimony of David Fassler, M.D.) ("[A]dolescents act on impulse. When they see a stimulus or they are in a frightening situation, they don't have the physical cognitive capacity, the developed pre-frontal lobes that say I shouldn't do this because there are X, Y, or Z consequences."); Casey Jones Motion, *supra* note 166, at 9 (stating that "science tell us that Casey did not have the logical reasoning and decision-making skills" to comprehend the import of carrying a gun near school, and "science tells us that the underdeveloped nature of Casey's brain means that when acting he does not process differently based on the location of where he is or where he plans to be"); *id.* at 19–20 (asserting the same claim for juveniles in general); *Garcia* Motion to Dismiss, *supra* note 187, at 9 ("[J]uveniles under 18 are incapable of possessing the mens rea required for capital offenses."); *id.* at 12 (asserting that the "inability of juveniles to modulate their emotional responses and make rational decisions is a biological fact"); RETHINKING THE JUVENILE, *supra* note 7, at 10 ("[D]eterrence does not work with juveniles.").

248 *See Garcia* Transcript I, *supra* note 187, at 218–19, 246 (testimony of Beyer) (conceding that adolescents sometimes make good decisions under stress); Bower, *supra* note 227, at 301 (quoting Harvard's Jerome Kagan as saying that teens must usually be able to "restrain their darker urges," or we would "be having Columbine incidents every week").

249 *Garcia* Transcript II, *supra* note 189, at 40–41 (testimony of Thompson) (responding to the question of how he knew Garcia was, by reason of frontal lobe disinhibition, unable to inhibit an impulse to shoot the victim when he had inhibited similar impulses at other emotionally intense moments, by offering as evidence the fact that he did shoot her).

4. Age Limits

Neuroscience also tends to run headlong into a perennial difficulty in juvenile justice: the search for a stable justification for pegging law's relative solicitude to the eighteenth birthday. Because it is implausible to posit that any given date constitutes a maturational tipping point, courts and theorists historically have relied on practical concerns justifying line-drawing.[250] States' choices are not consistent: while most terminate juvenile court jurisdiction at age eighteen, others choose seventeen or sixteen; all allow adult treatment of younger children in some circumstances; and all recognize different age milestones for benefits and responsibilities such as driving, voting, and drinking.[251] Adolescent brain science has not offered a theory by which this erratic line-drawing might be harmonized and may have further muddied the waters.

Developmental neuroscience consistently indicates that structural brain maturation is incomplete at age eighteen. Though estimates vary, many scientists have opined that structural maturation is not complete until the mid-twenties.[252] Some also have opined—including in court testimony—that just as brain maturation is completed by the mid-twenties, it starts to decline in middle age, perhaps as early as age forty-five.[253] Taking neuroscience as the proper benchmark therefore would suggest that the criminal justice system systematically should recognize the brain deficiencies of both young adults and the

250 *See* Roper v. Simmons, 543 U.S. 551, 574 (2005); Larry Cunningham, *A Question of Capacity: Towards a Comprehensive and Consistent Vision of Children and Their Status Under Law*, 10 U.C. DAVIS J. JUV. L. & POL'Y 275, 277–78 (2006).

251 *See, e.g.*, *Roper*, 543 U.S. at 579–88 & apps. A–D.

252 *See* Gur *Patterson* Declaration, *supra* note 68, at 3 (citing a "congruence of evidence" that maturation is complete "about age 21"); Bower, *supra* note 227, at 300 (relating Baird's belief that maturity is achieved at "25 or 26"); Sabbagh, *supra* note 2, at 24 (stating that Giedd was "surprised" at "how long [the brain] changes into young adulthood"). *But see* State v. Daniel, No. M2005-01211-CCA-R3, 2006 WL 3071329, at *10 (Tenn. Crim. App., Oct. 30, 2006) (involving an expert opining that "age 20 is when the full maturation process in 99 percent of individuals growing is-is peaked out").

253 Gur *Patterson* Declaration, *supra* note 68, at 12–13 (stating that men experience "age-associated decline" earlier than women); *Garcia* Transcript I, *supra* note 187, at 109 (testimony of Gur) (noting that the "brain begins to deteriorate at roughly after age 45"); *see also* Luna & Sweeney, *supra* note 243, at 299 (observing that "response inhibition" improves as children develop, but "diminish[es] in the aged"); Bower, *supra* note 227, at 301 (reporting the results of a study, Elizabeth R. Sowell et al., *Mapping Cortical Change Across the Human Life Span*, 6 NATURE NEUROSCIENCE 309, 312 (2003), showing that myelination peaks around age 45).

elderly.[254] Not only would such a position be politically untenable, particularly because young men between eighteen and twenty-four have a high criminal offense rate,[255] it would dilute any argument that there is something so developmentally special about age eighteen as to justify juvenile treatment for all below that age. Scholars and advocates understandably have conceded the date's artificiality but point to a societal consensus as to its significance.[256] Some articulate a deeper rationale: that eighteen is a reasonable guess as to when most people will have crossed an important developmental threshold even though they will continue to mature significantly.[257] However, as with relative deficiency, science cannot define that threshold, nor can it tell us precisely when it is likely to have been crossed.[258] Further, other evidence suggests that most adolescents achieve intellectual and cognitive maturity, though not psychosocial maturity, by the mid-teenage years.[259] There is, therefore, *some* law-relevant decisional maturation before eighteen, and it is not yet clear how to harmonize those

254 *Garcia* Transcript I, *supra* note 187, at 108 (testimony of Gur) (answering "unfortunately, . . . yes" when asked if "older people become less culpable because they're losing gray matter or parts of their mind"). One obvious distinction is that the elderly, unlike youth, have significant life experience on which to draw, and which may well compensate for much neural decline when making important decisions. This is a behavioral and environmental argument, not a neuroscientific one.

255 U.S. DEP'T OF JUSTICE, CRIME IN THE UNITED STATES tbl.39 (2007), http://www.fbi.gov/ucr/cius2007/data/table_39.html (showing that males eighteen to twenty-four account for nearly one-third of all violent crime, with offense rates highest at ages eighteen and nineteen).

256 *See, e.g.*, SCOTT & STEINBERG, *supra* note 5, at 70–81.

257 *Hearing on SB 513*, *supra* note 73, at 12–14 (testimony of Fassler) (stating that "certainly the vast majority of eighteen-year-olds will, at least from a biological, cognitive development standpoint," have capacity to be legally responsible for their actions).

258 *See* Fagan, *supra* note 85, at A7 ("Few people doubt that the brains of 13-year-old teens differ from the brains of 25-year-old adults. But the research doesn't make the types of age-graded distinctions that the new waiver laws make, especially in the critical age span of 14 through 19. . . . The legislatures and the courts are much more concerned with the fine distinctions of 15 versus 16 versus 17 years of age."). *But see* Casey Jones Motion, *supra* note 166, at 21 ("The brain of the 15, 16, and 17 year old is underdeveloped, just as is the brain of the 12, 13, and 14 year old.").

259 *See* Aronson, *supra* note 2, at 119; Baird, *supra* note 39, at 97–99; Laurence Steinberg, *Risk Taking in Adolescence: What Changes, and Why?*, 1021 ANNALS N.Y. ACAD. SCI. 51, 54 (2004). Competence studies reliably show, for example, that sixteen-year-olds have greater capacity than younger teens for understanding *Miranda* warnings. Thomas Grisso, *What We Know about Youths' Capacities as Trial Defendants*, *in* YOUTH ON TRIAL, *supra* note 1, at 139, 149–50. *See generally* THOMAS GRISSO, JUVENILES' WAIVER OF RIGHTS (1981) (finding that younger adolescents are far less likely to assert their rights when in custody than older adolescents).

findings with brain maturation. Just as neuroscience is not responsible for the difficulties of line-drawing, it does not resolve them.

Courts therefore rightly tend not to see in brain science significant support for a sharp dividing line at age eighteen. Generally this inures to youths' disadvantage, as when courts refuse to second-guess the legislatures' choice of the age at which children face transfer.[260] Sometimes, though, this inures to a defendant's advantage. An unexpected finding of the case analysis is that a good number of the cases reflecting successful brain-based defense arguments involve young adults.[261] An Illinois appellate court, for example, reduced an eighteen-year-old's forty-four-year sentence to thirty-six years, pointing to his great "rehabilitative potential," and in so doing appeared to endorse expert testimony on brain development.[262] Similarly, in *United States v. Gall*[263] a federal district court noted that "human brain development may not become complete until the age of twenty-five" before granting a downward departure to a man whose offense behavior occurred before he turned twenty-one and who had demonstrated rehabilitative potential.[264] That language was approvingly cited by the

260 The state's experts in *Garcia*, for example, questioned whether brain science proves so few developmental differences between older teens and those fourteen and under as to delegitimize the legislature's choice to expose only the former to mandatory transfer, a position with which the court appeared to agree. *See Garcia* Transcript II, *supra* note 189, at 208–10, 238–43 (testimony of Raine).

261 *See supra* note 119 (addressing four of eleven arguably "successful" arguments made by young adults). Qualitatively, it is striking that these cases are among those reflecting the most full-throated embrace of developmental neuroscience. *But see* Morton v. State, 995 So. 2d 233, 246 (Fla. 2008) (per curiam) (denying habeas petition for defendant convicted of capital murder committed when nineteen, and concluding that proffered 2004 brain-development study was not "newly discovered evidence"); Hodges v. State, 912 So. 2d 730, 764 (Miss. 2005) (holding that counsel was not ineffective in a capital sentencing proceeding for failing to call an expert on adolescent brain science, particularly given that the nineteen-year-old defendant was "legally an adult").

262 People v. Clark, 869 N.E.2d 1019, 1042 (Ill. App. Ct. 2007), *app. denied*, 875 N.E.2d 1116 (Ill. 2007). Clark, granted a new sentencing hearing on other grounds, called Gur to testify about adolescent brain development. *Id.* at 1026. The sentencing court found Gur's testimony "very fascinating" but declined to give it any weight, as Gur had not examined Clark's brain. *Id.* at 1040. The appellate court appeared to criticize the lower court on this ground. *Id.* at 1042 (appearing to disagree with the lower court's assessment that testimony "about generally accepted studies involving the brain development in adolescents . . . did not offer anything helpful").

263 374 F. Supp. 2d 758 (S.D. Iowa 2005), *rev'd and remanded*, 446 F.3d 884 (8th Cir. 2006), *rev'd*, 552 U.S. 38 (2007).

264 *Id.* at 762 n.2; *see also id.* ("Recent studies on the development of the human brain [are] of critical importance in the area of criminal law. . . . The Supreme Court based its most recent death penalty decision, *Roper v. Simmons*, on studies indicating

Supreme Court in upholding the departure.[265] Other courts have cited developmental neuroscience when granting sentencing concessions to young adults, including one case in which the judge noted—in dicta, as the defendant was twenty-two—that he had "conducted a review of the scientific literature in this area and believes there is compelling evidence that the judicial system's longstanding principle of treating youth offenders differently than adult offenders is justified in part based on the unformed nature of the adolescent brain."[266]

The fact that such evidence is having at least as much, if not more, influence in young-adult than juvenile cases is striking. Several explanations suggest themselves. First, many of the juvenile challenges were broader, taking on (for example) entire sentencing schemes, while the adult cases were narrow appeals to an allowable exercise of mercy at sentencing.[267] This cannot be the entire story, as some unsuccessful juvenile claims shared that characteristic;[268] how-

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adolescents are less culpable for their actions than adults. . . . [T]he recent NIH report confirms that there is no bold line demarcating at what age a person reaches full maturity. While age does not excuse behavior, a sentencing court should account for age when inquiring into the conduct of a defendant."). The sentencing court also cited many other factors justifying departure, including Gall's voluntary withdrawal from the conspiracy. *See id.* at 762–63.

265 The departure initially was overturned by the Eighth Circuit, but the Supreme Court reversed. Gall v. United States, 128 S. Ct. 586, 601 (2007) ("Given the dramatic contrast between Gall's behavior before he joined the conspiracy and his conduct after withdrawing, it was not unreasonable for the District Judge to view Gall's immaturity at the time of the offense as a mitigating factor, and his later behavior as a sign that he had matured and would not engage in such impetuous and ill-considered conduct in the future.").

266 United States v. Stern, 590 F. Supp. 2d 945, 953 (N.D. Ohio 2008) (citing *Gall*, *Roper*, and NIMH, TEENAGE BRAIN, *supra* note 153, and imposing relatively lenient sentence on twenty-two-year-old convicted of possession of child pornography, observing that defendant had begun viewing such materials when just fourteen). Like Gall, Stern had demonstrated rehabilitative potential. *Id.* at 955.

Additionally, an Idaho appellate court overturned a lower-court decision denying a twenty-year-old defendant's request for a neuropsychological evaluation to aid in sentencing. *See* State v. Izaguirre, 186 P.3d 676, 678–80 (Idaho Ct. App. 2008). The defendant had raised a sufficient issue as to his "neurocognitive abnormalities," and the appellate court believed defendant's proffered evidence about *normal* brain development to be relevant to that showing. *Id.* at 679–80 (presenting neuropsychiatrist's summarized research on brain maturation processes that continue "well into [the] late 20s" and chiding lower court for not considering such research). Numerous other factors also supported the appellate court's order of resentencing. *See id.* at 680–81 (citing, inter alia, sentencing judge's apparent disapproval of legislative scheme for murder sentencing).

267 *See Stern*, 590 F. Supp. 2d at 957.

268 *See Clark*, 869 N.E.2d at 1042.

ever, it is buttressed by the fact that most of the marginal juvenile successes also fit that model.[269] Second, perhaps these judges would have taken the same position had the defendants been juveniles, but also believed that evidence of continuing neural development counsels that the relative solicitude historically limited to those under eighteen ought also extend to young adults.[270] Third, and on a deeper level, perhaps juveniles asserting such claims appear to courts to be *unusual juveniles*, that is, more calculating, callous, and dangerous, while these young adults appear to be *unusual adult offenders*, that is, *less* calculating, callous, and dangerous.[271] The developmental attributes thought to stem from brain maturation may seem to conflict with perceptions of the former and to cohere with perceptions of the latter; that is, the perceived relevance of brain science may stem not from its inherent persuasive power but from the degree to which it challenges or confirms perceptions based on other factors.[272]

Whatever the explanation, the lack of clear age-limit implications for developmental neuroscience poses a challenge to those who seek thus to justify sharp dividing lines.

5. Equality and Autonomy Commitments

Finally, direct reliance on developmental neuroscience implicates commitments to equality and teen autonomy. While the latter danger

269 Cotting v. State, No. A-9909, 2008 WL 4059580, at *2 (Alaska Ct. App. Sept. 3, 2008); Ling v. State, No. A-9228, 2008 WL 2152028, at *2 (Alaska Ct. App. May 21, 2008); State v. Carrasquillo, 962 A.2d 772, 775–76 (Conn. 2009).

270 *See* Melissa S. Caulum, Comment, *Postadolescent Brain Development: A Disconnect Between Neuroscience, Emerging Adults, and the Corrections System*, 2007 WIS. L. REV. 729, 755–58 (arguing that the jurisdictional age for juvenile court should be raised to benefit "emerging adults").

271 *See, e.g.*, State v. Ninham, 767 N.W.2d 326, 329–30 (Wis. Ct. App. 2009) ("Ninham's crime was unusual for its senseless and extreme brutality. When combined with his lack of remorse, his prior record and other crimes he committed while awaiting trial, his case is distinguished from other juveniles arrested for murder or manslaughter."); *cf.* Emens, *supra* note 58, at 77 (noting that jurors might perceive juveniles facing death penalty as so unlike normal children as to seem "monstrous, evil, or genetically defective").

272 This, too, is unlikely to be a full explanation, as some juveniles appeared to present sympathetically. *See, e.g.*, *In re* J.B., No. CA2004-09-226, 2005 WL 3610482, at *18–20 (Ohio Ct. App. Dec. 30, 2005) (noting that the court took "no pleasure" in sentencing the juvenile defendant); *cf.* MICHELE DEITCH ET AL., FROM TIME OUT TO HARD TIME 2–5 (2009), *available at* http://utexas.edu/lbj/news/images/file/From%20Time%20Out%20to%20Hard%20Time-revised%20final.pdf (offering far more sympathetic narrative of Christopher Pittman than appears in courts' opinions). The role of belief confirmation is discussed further *infra* Part III.

has been partially addressed by commentators, both remain worrisome.

Just as developmental neuroscience might, if taken literally, counsel special treatment of the elderly, it might counsel differential treatment of girls and boys. Brain maturation is importantly linked to puberty, and girls tend to reach puberty significantly earlier than boys.[273] Though physical and sexual maturity are poor proxies for either brain maturity or cognitive development,[274] there is a clear gender differential, likely linked to pubertal onset. Girls, on average, experience early-adolescence neural exuberance—particularly in the frontal lobes—at least a year before boys, and possibly more.[275] If structural brain maturity were the correct legal metric, it would counsel that boys and girls become subject to juvenile-court jurisdiction, and age out of it, at different times; indeed, one testifying expert has conceded as much.[276]

The behavioral implications of brain-level gender differences are largely unknown.[277] Whatever they may be, law should not track

273 Ronald E. Dahl, *Adolescent Brain Development: A Period of Vulnerabilities and Opportunities*, 1021 ANNALS N.Y. ACAD. SCI. 1, 12–16 (2004) (calling for more research on puberty and brain maturation); Judy L. Cameron, *Interrelationships Between Hormones, Behavior, and Affect During Adolescence*, 1021 ANNALS N.Y. ACAD. SCI. 134, 139 (2004) (same); Gur *Patterson* Declaration, *supra* note 68, at 11 (referencing 1996 study showing sex differences).

274 Dahl, *supra* note 273, at 15–18 (stating that capacity for "planning, logic, reasoning ability, inhibitory control, problem solving, and understanding consequences," seem to depend on age and experience rather than timing of puberty; however, studies have shown "a significant positive correlation between pubertal maturation and sensation seeking" in both boys and girls, which is associated with greater risk-taking behaviors).

275 BRIZENDINE, *supra* note 4, at 44 (claiming that the female brain "matures two or three years earlier the male brain"); STRAUCH, *supra* note 4, at 54 (citing study showing girls' faster myelination, which "may be one reason why young girls often seem to attain emotional maturity before boys"); Giedd et al., *supra* note 36, at 862–63 (noting that the earlier gray-matter peak in girls corresponds with "earlier age of onset of puberty" and "suggests a possible influence of gonadal hormones"); Giedd, *supra* note 237, at 79, 82 (noting other gender differentials, such as overall cerebral volume). *But see Hearing on SB 513*, *supra* note 73, at 13 (testimony of Fassler) ("We have not found differences in boys and girls in the research that has been done to date . . . . The research we have so far does not show differences in that level of brain development.").

276 *Garcia* Transcript I, *supra* note 187, at 65 (testimony of Gur) (stating that, because girls' brains mature faster, "biology would say" that they should be held to a different standard for accountability than boys); *see also* Buss, *supra* note 13, at 513 (raising similar concern about gender implications).

277 Giedd, *supra* note 237, at 83 ("The connection between these structural changes and behavioral changes is only beginning to be elucidated."); Charles A. Nel-

them. Indeed, behavioral research already shows that boys and girls have markedly different propensities for violence and lawbreaking,[278] and law rightly does not officially impose more severe punishment for girls' violent acts because they are less normative.[279] While the equality concern is most evident for gender, it is not confined to it. It would apply to any group for whom a statistically significant developmental trend could be identified, including racial or socioeconomic groups. As race is strongly linked to age of pubertal onset—it is well documented, for example, that African American girls tend to begin puberty much earlier than white American girls—boys and girls of different races might be subject to different rules.[280] Any argument that law's treatment of children should track developmental neuroscience must demonstrate why such inequality is not its logical outcome, and the only way to do so is to concede that neuroscience (and, for that

son, *Brain Development During Puberty and Adolescence*, 1021 ANNALS N.Y. ACAD. SCI. 105, 108 (2004) ("[W]hat are the functional correlates of changes in gray and white matter before and after puberty, and how do these morphological changes account for sex differences?"); Deborah A. Yurgelun-Todd & William D.S. Killgore, *Fear-Related Activity in the Prefrontal Cortex Increases with Age During Adolescence: A Preliminary fMRI Study*, 406 NEUROSCIENCE LETTERS 194, 198 (2006) (stating that sex differences in frontal activation contribute to "rapidly growing evidence supporting sex-related differences in neuroanatomy, neurochemistry, and neurocognitive functioning"). Caution is particularly warranted here, as claims about the relatively small size of female brains long were invoked to support female subordination. BRIZENDINE, *supra* note 4, at 1.

278 SNYDER & SICKMUND, *supra* note 55, at 132 (showing teen boys' violent-crime arrest rate to be at least four times that of girls). Indeed, all gendered behavioral differences (like all behaviors) are somehow operationalized in the brain. *See* STRAUCH, *supra* note 4, at 116, 134–36 (noting that psychological studies show earlier mature thinking in girls); Marisa M. Silveri et al., *Trajectories of Adolescent Emotional and Cognitive Development*, 1021 ANNALS N.Y. ACAD. SCI. 363, 364 (2004) (citing gender differences in "emotional intelligence, academic achievement, and cognitive functioning," as well as differential impact of familial drug abuse); Laura R. Stroud et al., *Sex Differences in the Effects of Pubertal Development on Responses to a Corticotropin-Releasing Hormone Challenge*, 1021 ANNALS N.Y. ACAD. SCI. 348, 350 (2004) (noting that gender differential in depressive disorders likely linked to brain-level differences).

279 Evidence that the juvenile justice system sometimes does, as a de facto matter, punish girls more harshly is rightly seen as disparate treatment. *See* OFFICE OF JUVENILE JUSTICE & DELINQUENCY PREVENTION, U.S. DEP'T OF JUSTICE, GUIDING PRINCIPLES FOR PROMISING FEMALE PROGRAMMING, at ch.1 (1998), http://www.ojjdp.ncjrs.org/pubs/principles ("[G]irls who break the law are sometimes treated more harshly than boys who offend.").

280 *See* Dahl, *supra* note 273, at 12–13 & fig.3. Moreover, girls who experience greater family stress might reach puberty significantly earlier, and family stress tends to correlate with socioeconomic disadvantage. *See* Cameron, *supra* note 273, at 134, 137.

matter, developmental science generally) must sometimes give way to other values.

Undue emphasis on the immature brain also might alter our societal commitment to allow teens incrementally greater control over important aspects of their lives—whether to access health services, leave school, marry, exercise their right to free speech, and the like. This issue has been transparent since *Roper*, in which Justice Scalia, in dissent, excoriated the American Psychological Association for taking what he saw as inconsistent stances on teen maturity in death penalty and abortion cases.[281] As other commentators—in analyses whose full repetition is unnecessary here—correctly have argued, the state can, does, and should distinguish between the competence necessary to make certain critical choices about one's fate—such as whether to have an abortion—and the relative moral blameworthiness and capacity for change that justifies differential treatment when accused of a crime.[282] But a strong and simple message about brain immaturity poses a challenge to making complicated and contingent claims about autonomy, and the former easily is interpreted to be in irreconcilable tension with the latter.[283] Indeed, even some defense experts have endorsed incursions into teen autonomy for this reason.[284] There are no simple answers to when teens deserve and can handle the right to

281 *See* Roper v. Simmons, 543 U.S. 551, 617–18 (2005) (Scalia, J., dissenting).

282 *See* Donald L. Beschle, *Cognitive Dissonance Revisited:* Roper v. Simmons *and the Issue of Adolescent Decision-Making Competence*, 52 WAYNE L. REV. 1, 28–29 (2006); Casey et al., *supra* note 28, at 122 (stating that legal decisionmakers should differentiate between culpability and teens' ability to make "informed choices about their futures"); Chernoff & Levick, *supra* note 98, at 217–18; Kimberly M. Mutcherson, *Minor Discrepancies: Forging a Common Understanding of Adolescent Competence in Healthcare Decision-Making and Criminal Responsibility*, 6 NEV. L.J. 927, 948–53 (2006); Laurence Steinberg et al., *Are Adolescents Less Mature Than Adults? Minors' Access to Abortion, the Juvenile Death Penalty, and the Alleged APA "Flip-Flop,"* 64 AM. PSYCHOLOGIST 583, 592–93 (2009), *available at* http://www.temple.edu/psychology/lds/documents/JDP.pdf.

283 *See, e.g.*, *In re* D.L., No. B205263, 2009 WL 43513, at *3–4 (Cal. Ct. App. Jan. 8, 2009). In *D.L.*, a child-dependency judge partially justified his decision to remove an infant from the custody of the twenty-two-year-old father, by referencing judicial education programs in which the judge learned that brain development is not complete in early adulthood. The judge opined that the father (who had begun a sexual relationship with the fifteen-year-old mother when she was thirteen) would not have adequate "judgment" to know what is "age appropriate" for his child until he was twenty-six years old, at which time he would have a fully mature brain. *Id.* at *5.

284 *Garcia* Transcript I, *supra* note 187, at 86 (testimony of Gur) (testifying that he would be hesitant to let a sixteen-year-old decide to forego cancer treatment because of brain immaturity). It could instead be argued that teens need experience making hard choices in order for their brains to mature, a theory that is consistent with the idea that teens nonetheless should be shielded from the harshest consequences of

direct the many aspects of their lives, and the answers will vary according to the multiplicity of interests at stake (for example, teens' right to free speech deserves far greater protection than their ability to drive cars). Adolescent brain science appears (wrongly) to offer far too simple an answer, one that points in most instances away from autonomy.

C. Advocacy Pressures

The previous Section delineated the intrinsic limitations of developmental neuroscience for juvenile justice. It also raised reasons to be concerned were neuroscience to be given the influence some have urged. One additional concern is intrinsic to all efforts to link law to science. The realities of advocacy, in which nuance and complexity are difficult to convey without compromising effectiveness, incentivize advocates to oversimplify. All scientific data must be simplified for legal or policy arguments, if for no other reason than to render them comprehensible. But simplification easily can creep into oversimplification, creating a risk that legal decisions will be based on incorrect premises. This danger is not unique to juvenile justice,[285] but it has manifested in this context, and its presence counsels great caution.

Consider, for example, how advocates, experts, and commentators tend to characterize teenagers' recruitment of the amygdala, an evolutionarily old brain structure often described as the seat of primitive, aggressive impulses.[286] They consistently assert that teenagers act more "emotionally" than adults, who are more "rational," and that such emotionalism explains teens' criminal behaviors.[287] They

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bad choices. *Cf.* ZIMRING, *supra* note 29, at 17–22 (conceptualizing adolescence as a "learner's permit period of life").

285 *See* Buss, *supra* note 13, at 507 ("Common to the law's use of all social science is the risk of bad data or misused data, and the danger that lawmakers will not have the sophistication or the inclination to assess the data closely and limit its use accordingly.").

286 *See* GAZZANIGA ET AL., *supra* note 43, at 537, 553–72 (explaining the complex roles of the amygdala); Phelps & Thomas, *supra* note 238, at 750, 753, 755 (explaining that the amygdala is important to emotional learning, implicit evaluation, and memory, but asserting that "it is a mistake to assume any given brain region 'does' a given behavior, just as it is a mistake to assume that activity in a given brain region predicts a single behavior").

287 *See, e.g.*, Casey Jones Motion, *supra* note 166, at 6; *Garcia* Transcript I, *supra* note 187, at 156 (testimony of Beyer) ("The immature behavior we see in teenagers comes in large part because they are so driven by a primitive emotional process rather than the deliberative thought process that we see in adults."); RETHINKING THE JUVENILE, *supra* note 7, at 11–13; *cf.* Brief of the American Society for Adolescent Psychiatry et al. as Amici Curiae in Support of Petitioners at 19, 48, Stanford v. Kentucky, 492 U.S. 361 (1989) (Nos. 87-5666, 87-6026), 1988 U.S. S. Ct. Briefs LEXIS 56 (adoles-

explain this tendency toward unchecked emotionalism as the consequence of an overactive amygdala that has not yet been tamed by mature, rational frontal lobes.[288] In addition to oversimplifying the complex role of the amygdala, this narrative overstates the behavioral implications of relevant studies.[289]

In support of this narrative advocates, experts, and commentators most frequently cite to a small number of functional-imaging studies that show teens to display more amygdala, and less frontal-lobe, activation than adults when engaged in an emotion-recognition task.[290]

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cence is "characterized by emotionality rather than rationality," and "[e]motionality . . . leads adolescents to commit capital offenses").

288 *Hearing on SB 513*, *supra* note 73, at 6–7 (testimony of Fassler) ("[T]he primitive, or instinctual part of the brain develops first . . . we're talking about the amygdala, which is . . . responsible for gut reactions, including fear and aggressive behaviors, versus areas like the frontal cortex, which develops later and helps us control our emotions and modify our actions and responses."); *Garcia* Transcript I, *supra* note 187, at 95 (testimony of Gur) (stressing role of teens' "vibrant" amygdalae in violent behavior); *Garcia* Transcript II, *supra* note 189, at 43 (testimony of Thompson) ("[H]e has a very weak frontal system, and the system which is driving it, the limbic system, is running at high gear."); *Garcia* Motion to Dismiss, *supra* note 187, at 1; Lucy C. Ferguson, Comment, *The Implications of Developmental Cognitive Research on "Evolving Standards of Decency" and the Imposition of the Death Penalty on Juveniles*, 54 AM. U. L. REV. 441, 455 (2004) ("Instead of using the pre-frontal cortex to make decisions, research indicates that adolescents rely more heavily on the amygdala, the emotional center of the brain. Consequently, adolescents typically exhibit poorer risk assessment than adults and behave in a more impulsive manner." (footnotes omitted)); Krueger, *supra* note 2 (contrasting how the teen amygdala "is in full swing" while frontal lobe "is barely firing at all"); Barbara Cooke, *The Teenage Brain*, http://life.familyeducation.com/teen/growth-and-development/36499.html (Aug. 2005) ("[T]eens whiz through life manipulated by the wild whims of the amygdala, home to primal feelings, such as fear, rage, and impulse.").

289 The narrative also overstates the irrationality of emotion and understates the extent to which emotion influences adult decisionmaking. *See, e.g.*, Terry A. Maroney, *Law and Emotion: A Proposed Taxonomy of an Emerging Field*, 30 LAW & HUM. BEHAV. 119, 121–23 (2006) (discrediting the opposition of emotion and reason); Maroney, *supra* note 51, at 1387–88, 1404–08 (advocating that emotional and cognitive capacity both form necessary part of "reason").

290 *See, e.g.*, State v. Ninham, 767 N.W.2d 326, 330 (Wis. Ct. App. 2009) (citing defendant's contention that recent research "shows adolescents' amygdalas are more active than adults'. The amygdala is closely related to emotionally-laden responses."). There are several such studies with a variety of findings, though advocates and commentators tend primarily to discuss the unpublished data described in a study by Deborah A. Yurgelun-Todd and William D.S. Killgore. *See* Yurgelun-Todd & Killgore, *supra* note 277, at 195–98; *see also* Baird et al., *supra* note 44, at 196 (providing similar data); Frontline, *Interview: Deborah Yurgelun-Todd*, PBS, Jan. 2002, http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/interviews/todd.html [hereinafter Yurgelun-Todd Frontline Interview]. For reliance on such studies, see, for example, *Hearing on SB 513*, *supra* note 73, at 7 (testimony of Fassler) (noting that "[f]unctional

These studies provide little support for the assertion. In a typical study, subjects' brains are scanned while they view photographs of unfamiliar persons displaying stylized "fearful" facial expressions; they then are asked to identify the emotion being displayed. This task bears little relation to juvenile offending.[291] The only reported behavioral outcome is teens' higher rate of misidentification of the emotion,[292] and that differential may be erased by using color photographs and including images of people the teens know.[293] It is tempting to conclude (as at least one researcher has) that a teenager, if confronted with a person displaying a fearful expression, is likely to misinterpret that expression and harm the person out of a misguided instinct toward self-defense.[294] That conclusion may be true, but it cannot be reached on the basis of the studies.[295] Indeed, other stud-

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studies" show that teens "tend to rely more on these instinctual areas, like the amygdala, and less on the more advanced areas, like the frontal lobes, which are associated with more goal-oriented and rational thinking"); *Garcia* Transcript I, *supra* note 187, at 182 (testimony of Beyer) ("It's likely that [David Garcia's] brain, like those of the teenagers that are being studied in the MRI studies would show an over reliance on the primitive emotion center of the brain . . . ."); Bower, *supra* note 227, at 300 (describing facial recognition studies); Spear, *supra* note 41, at 440 (describing unpublished study); Ortiz, *supra* note 70, at 2 (summarizing Yurgelun-Todd's study); Wallis, *supra* note 2, at 56–59 (same).

291 This is a problem for behavioral research generally. *See* Steinberg, *supra* note 259, at 52–53, 55–56 (describing efforts to design studies that better mimic teens' real-world decisionmaking); Fagan, *supra* note 85, at A7 ("[W]e know next to nothing about how brains react under real-world conditions of threat, arousal, or peer provocation."). However, it is particularly pronounced in brain imaging research given the technological restraints (for example, needing to immobilize the subject).

292 *See* Yurgelun-Todd Frontline Interview, *supra* note 290 (describing small unpublished study showing adults correctly identified emotion one hundred percent of time while teen rate was fifty percent); *see also* Aronson, *supra* note 2, at 122 (same); *cf.* Baird et al., *supra* note 44, at 198 (describing how, though without an adult comparison group, teens correctly identified fearful emotional expression seventy-four percent of time).

293 *See* Aronson, *supra* note 2, at 123 (stating that researcher questioned extent to which studies revealed "anything relevant about impulse control"); Beckman, *supra* note 63, at 599; Bower, *supra* note 227, at 300.

294 *See Hearing on SB 513*, *supra* note 73, at 13 (testimony of Fassler) ("When you show a stimulant, a picture of someone who is frightened to a sixteen or seventeen year old, they respond in fear. They don't recognize it as someone who is frightened. They are much more likely, if they are standing in a gas station with a gun, they are much more likely to impulsively pull that trigger.").

295 One study claims to have generated the first preliminary data suggesting a general developmental shift toward frontal rather than amygdala activation. *See* K. Rubia et al., *Functional Frontalisation with Age: Mapping Neurodevelopmental Trajectories with fMRI*, 24 NEUROSCIENCE & BIOBEHAVIORAL REVS. 13, 18 (2000). *But see* Yurgelun-Todd & Killgore, *supra* note 277, at 198 (finding "no evidence of systematic age-related

ies show that when presented with different tasks teenagers tend to display *greater* frontal-lobe activity than adults.[296] This does not suggest that they are somehow more "rational," but instead may indicate that processes that have by adulthood become automatic require more effortful thought for adolescents.[297] Some studies indicate that aggression and violence sometimes correlate with *low* levels of amygdala activation;[298] yet others suggest that teens have great variation in amygdala response.[299]

In short, the brain's emotional circuitry is highly complex. Teens unquestionably have distinctive emotional experiences.[300] They may well have distinctive neural patterns of emotional activation and of emotion-cognition interaction, and those patterns may well be linked to maturation processes, but to date we know little about these phenomena or their behavioral implications.[301] Teens' emotional lives,

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change in functional activity of the amygdala" in adolescence, though data suggest possible greater involvement of frontal areas). For a review of the state of this aspect of the science, see Casey et al., *supra* note 28, at 111–12.

296 *See* Luna & Sweeney, *supra* note 243, at 302; *see also* Beckman, *supra* note 63, at 597–99 (describing, inter alia, a study that showed that "adolescents' prefrontal cortices were considerably more active than adults'" in an impulse-suppression task).

297 David J. Kupfer & Hermi R. Woodward, *Adolescent Development and the Regulation of Behavior and Emotion*, 1021 ANNALS N.Y. ACAD. SCI. 320, 320 (2004). It is worth considering that groups' differential recruitment of brain pathways ultimately may bear no relation to measurable differences in behavior. *See, e.g.*, BRIZENDINE, *supra* note 4, at 5 (claiming that studies show "no performance differences between . . . men and women" in certain tasks despite "significant, sex-specific differences in the brain circuits they activated").

298 *See* Baird, *supra* note 39, at 115–16 (citing, inter alia, Adrian Raine, *Biosocial Studies of Antisocial and Violent Behavior in Children and Adults: A Review*, 30 J. ABNORMAL CHILD PSYCHOL. 311 (2002)).

299 *See* Tara Parker-Pope, *The Brain of a Bully*, N.Y. TIMES WELL BLOG, Nov. 12, 2008 http://well.blogs.nytimes.com/2008/11/12/the-brain-of-a-bully (reporting on an fMRI study by Jean Decety and explaining how only those identified behaviorally as "bullies" show greater amygdala response to certain images).

300 *See* Dahl, *supra* note 273, at 2, 7–9 (noting there is a "natural biologic proclivity toward high-intensity feelings that emerges at puberty" and that "emotional changes in adolescence have been generally recognized for many centuries"); Carolyn Saarni et al., *Principles of Emotion and Emotional Competence*, *in* CHILD AND ADOLESCENT DEVELOPMENT, *supra* note 38, at 361, 374–75.

301 A very plausible hypothesis is that neural exuberance, myelination, and pruning converge to "support[ ] the development of a coordinated relationship between emotional and cognitive processes, a relationship whose integrity is critical to the production of behavior in accordance with personally or socially mandated standards." Baird, *supra* note 39, at 83; *see also* Dahl, *supra* note 273, at 18 ("The ability to integrate these multiple components of behavior—cognitive *and* affective—in the service of long-term goals involves neurobehavioral systems that are among the last regions of the brain to fully mature.").

and their patterns of criminal behavior, cannot be reduced to the relative strength of amygdala response; they are shaped by a rich set of factors including social goals and expectations, as well as relative lack of life experience.[302]

It may be tempting to regard the frequently flattened or even distorted portrayal of neuroscience as harmless if it appears to come "close enough" to the truth for legal, not laboratory, purposes. The temptation is strong for all biological explanations, as if a trait or behavior is partially determined, then society is less inclined to regard it as morally blameworthy.[303] It is even stronger at present, as people seem now to find neuroscientific explanations particularly persuasive.[304] This temptation must be resisted. Inaccuracy has costs. Some are immediate: it may, for example, prompt one's opponent either to offer an equally inaccurate counterclaim (which a court might accept), or successfully to impeach evidence that might have been persuasive were it not being oversold. Some costs, though, cannot presently be anticipated and have wider reach. If, for example, courts were routinely to endorse the "unchecked-amygdala" explanation for teen behavior, that endorsement would lend undeserved support to

302 Kupfer & Woodward, *supra* note 297, at 321. A second sort of oversimplification visible in both the cases and commentary is relative inattention to other biological processes shaping adolescents' brains and behaviors. Genetics, neurochemistry, and hormones—to name just a few—all play significant roles, but have received far less attention in juvenile justice. *See, e.g.*, BRIZENDINE, *supra* note 4, at 32–56 (presenting theory of female brain development centered on hormonal influences in adolescence); Cameron, *supra* note 273, at 110; Rudolf N. Cardinal et al., *Limbic Corticostriatal Systems and Delayed Reinforcement*, 1021 ANNALS N.Y. ACAD. SCI. 33, 43–44 (2004); Casey et al., *supra* note 28, at 113, 118–119 (identifying the role of dopamine and hormones). A dominant focus on structural brain maturity creates an inaccurate impression as to its relative importance.

303 *See generally* Nita A. Farahany, *Law and Behavioral Morality, in* NOMOS LII: EVOLUTION AND MORALITY (Sandy Levinson ed., forthcoming 2009) (manuscript at 2) (defining "behavioral morality" as "a form of moral philosophy that claims that deviant behavior attributable to a physical cause is either less or is not at all morally blameworthy"), *available at* http://ssrn.com/abstract=1336268. For instance, some credit recent advances in gay and lesbian civil rights to increased public belief in a biological basis for sexual orientation. Barbara Fedders, *Coming Out for Kids: Recognizing, Respecting, and Representing LGBTQ Youth*, 6 NEV. L.J. 774, 782 (2006); Posting of Jeff Walsh to Oasis Magazine, http://www.oasisjournals.com/issues/9705/cover.html (May 1, 1997, 6:00 AM EST) (quoting Simon LeVay, a researcher for the Salk Institute: "There is no question that people who think sexuality is imborne [sic] are, in general, much better disposed towards gay people and gay rights than people who think it's some kind of lifestyle choice. . . . I've run into many people whose minds have been changed due to the science.").

304 *See* Aronson, *supra* note 2, at 119 ("[This] culture finds . . . biological explanations of behavior and personality captivating.").

an underlying theory about the low value of "emotion" relative to "reason." That pernicious distinction already infects legal analysis, and it should receive no further encouragement.[305]

Some of these dangers can be mitigated by high-quality advocacy that seeks to portray science in as nuanced and grounded manner as possible. A number of contemporary efforts satisfy that criterion.[306] However, the need to be consistent with the advocacy goal provides a built-in incentive to oversimplify, one that cannot be eliminated.

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This Part has shown that, contrary to many predictions, adolescent brain science has had no deep impact on juvenile justice in the courts. It has proved generally insufficient to uproot doctrine that tends to disfavor juveniles' claims, particularly when they are accused of serious crimes. While most courts have ignored neuroscientific arguments, some have soundly rejected them, particularly where the individual juvenile appears to be an exception to the argued rule. One of the main beneficiaries of brain-based advocacy is a group not specifically targeted by most scholars and advocates: young adults. Those courts that have reacted favorably to arguments about the adolescent brain, whether for young adults or juveniles, have done so to buttress conclusions reached on other grounds.

More, this Part has shown that these trends are far from irrational. Developmental neuroscience does not shed direct light on the highly individualized determinations that are so commonly at issue in specific criminal cases. Its implications cannot be fully grasped until its link to behavior is better understood. To tether law to that science creates dangers—inequality, diminished autonomy, and inaccuracy—with no intrinsic hedge. Therefore, adolescent brain science should not on its own meaningfully shift doctrine, even if that shift is normatively desirable. Its inherent limitations do, and should, limit its influence. These conclusions closely parallel those other scholars have reached in theorizing the role of neuroscience in adult criminal

305 *See* Maroney, *supra* note 289, at 121–23, 135; Maroney, *supra* note 51, at 1434.

306 The APA's brief in the *Sullivan v. Florida* and *Graham v. Florida* cases provides one example. That brief accurately relates the basics of structural brain maturation and uses appropriately cautious language in describing the ways in which such maturation is "thought" to be "consistent with the demonstrated behavioral and psychosocial immaturity of juveniles." APA *Sullivan & Graham* Brief, *supra* note 128, at 27; *see also id.* (acknowledging that "the precise underlying mechanisms of brain development continue to be studied").

law.[307] Insights from that literature have not before now significantly penetrated debates within juvenile justice.[308] As this Article demonstrates, they should.

This is a sobering picture. The following Part, though, presents a vision of the real—albeit limited—role that adolescent brain science nonetheless can play in moving juvenile justice away from the destructive trends of the last two decades.

III. A LIMITED ROLE FOR ADOLESCENT BRAIN SCIENCE WITHIN JUVENILE JUSTICE

The findings of the previous Part confirm the skepticism that many developmental neuroscientists have themselves expressed about the legal relevance of their research.[309] That research is not, however, utterly irrelevant.[310] It contributes marginally to our understanding of general principles about the distinctiveness of adolescence as a developmental stage. General principles matter. The general principles that, as a group, normal young people differ from normal adults in systematic ways directly relevant to their relative culpability, ability to be deterred, and potential for rehabilitation, were for most of the last century invoked to justify differential treatment of juvenile offenders in virtually all instances, with only narrow exceptions. Always supported (if erratically) by everyday observation, these beliefs are now well supported by behavioral and criminological research. In the last two decades the juvenile justice landscape has shifted dramatically as our collective commitment to those principles has eroded, though (as *Roper* showed) that commitment is far from extinguished. The ero-

307 *See, e.g.*, Brown & Murphy, *supra* note 36 (manuscript at 77–79); Robert M. Sapolsky, *The Frontal Cortex and the Criminal Justice System*, *in* LAW AND THE BRAIN, *supra* note 47, at 227–228, 238–40 (outlining differences between the questions asked by neuroscience and those asked by law, and theorizing how the former might nonetheless inform the latter); Snead, *supra* note 119, at 1280–99, 1338–39.

308 One exception is Morse, *supra* note 59 (applying certain insights from the law-and-neuroscience field to the juvenile justice context).

309 Several prominent developmental neuroscientists have taken "a dim view of the movement to apply neuroscience to the law," and even those who believe that "'[b]rain data are eventually going to support reduced legal culpability for adolescents'" believed as recently as 2004 that "'we're not quite there yet.'" Bower, *supra* note 227, at 301 (quoting Ronald Dahl); *see also* Aronson, *supra* note 2, at 134 (detailing debate).

310 *See* Steinberg, *supra* note 8 (manuscript at 4) (discussing that "[w]hile it is undoubtedly true that the neuroscience evidence has sometimes been embraced too uncritically, explained too glibly, or extended too broadly," it should not be "dismissed too readily, described as less conclusive than it actually is, and banished from the discussion prematurely").

sion can and should be reversed, and to the limited degree to which brain science helps remind us of these first principles, it is useful.[311]

Adolescent brain science therefore is appropriately considered by legal decisionmakers performing a policymaking function. "[A]ggregate data" about youth should be considered when formulating "policy that will optimize the costs and benefits of treating a large similar group in a particular way."[312] Because neuroscience generally corroborates the beliefs traditionally undergirding a strong and separate juvenile justice system, it somewhat strengthens the confidence policymakers can have in those beliefs. If this minor buttressing role is less spectacular than some would hope, it is a real one. More, this role could expand if the science eventually were to show stronger connections between neural structure, neural functioning, and externalized behaviors. Neuroscience is simply one new input into the well-established interface between juvenile justice policy and developmental science.[313]

311 A full defense of the wisdom of maintaining a strong, separate, and substantively distinct juvenile justice system for virtually all persons under eighteen is beyond the scope of this Article, and has been made more than adequately by numerous other scholars. Suffice it to say that this author concurs.

312 Pinker, *supra* note 226, at 50 (making this point with regard to policy uses of genetic data, but stating that using such data to reach conclusions about the attributes of any given person "is just plain weird").

313 At this juncture it is worth addressing directly the reality that behavioral studies suffer from at least some of the same scientific limitations described in the previous Part. For example, individual variation is just as true of behavioral maturity as it is of neural maturity. Behavioral studies also carry some of the same potentially undesirable implications. For example, they show even more relevant differences between girls and boys. Further, as Part I made clear, rigorous behavioral study of adolescence is only a few decades older than neuroscientific research.

There are, however, several features of behavioral work that commend it as a more relevant and stable source on which to draw in making juvenile justice policy. First, as the law cares primarily about behavior, direct measures of behavioral traits and tendencies always will be one giant step closer to law's core than will studies of underlying correlates (or even causes) of behavior. *See* Greene & Cohen, *supra* note 49, at 1779 (critiquing Scott and Steinberg's view of the importance of adolescent brain science, in part because such evidence is indirectly relevant while evidence of behavior is directly relevant); Steinberg, *supra* note 8 (manuscript at 22) ("[I]n the formulation of policy, the scientific evidence in which we should place the most faith is the evidence that is most similar to the actual behavior the policy is intended to regulate."). Second, psychology provides tools for directly measuring law-relevant traits, so the match between group behavioral tendencies and individual behavioral characteristics can be tested to a non-negligible degree. *See, e.g.*, Richard Dembo & Amanda Anderson, *Problem-Oriented Screening Instrument for Teenagers*, *in* MENTAL HEALTH SCREENING AND ASSESSMENT IN JUVENILE JUSTICE 112, 112 (Thomas Grisso et al. eds., 2005) (describing POSIT, a psychological screening test for adolescents);

It is for this reason, too, that neuroscience has more natural traction within juvenile justice than it does in adult criminal justice. Any system of criminal law that incorporates determination of responsibility necessarily rests on the fundamental assumption that persons possess—and can exercise—free will, unless some gross pathology exists. At a minimum, the philosophical orientation of such a criminal law must be compatibilist in order to function.[314] Neuroscientific arguments that purport to challenge free-will or compatibilist theories may be of theoretical interest but are unlikely to influence practice; neuroscience rightly will have greater influence if it can prove or fine-tune determinations already within the purview of criminal law, such as showing that some identifiable pathology contributed to insanity or incompetence.[315] A modest invocation of adolescent brain science has far more in common with the latter than the former. At least where advocates avoid biological determinism, developmental neuroscience steers clear of fundamental questions about free will and instead describes one aspect of a type of relative disability—youth—the law historically has recognized. Its insights—correctly contextualized—therefore may be made available to policymakers to take for what they are worth.[316]

Edward P. Mulvey & Anne-Marie R. Iselin, *Improving Professional Judgments of Risk and Amenability in Juvenile Justice*, FUTURE OF CHILD., Fall 2009, at 35, 40–44 (2008) (explaining the interplay between clinical and actuarial assessment).

Despite these distinctions, the shared limitations and implications of these two types of developmental science counsel that juvenile justice policy ought not directly and literally rely on such science, even if it should be significantly enriched by its findings. *See* Buss, *supra* note 13, at 507–08. One distinct benefit of criminological studies—for example, deterrence and desistance studies of actual juvenile populations—is that they measure offense behavior in the real world and can directly measure the impact of different legal schemes, social environments, and interventions. *See generally infra* text accompanying notes 331–38 (discussing advocates' task of educating policymakers and the public about the real-word effects of juvenile policy).

314 *But see* Greene & Cohen, *supra* note 49, at 208 (arguing instead that current legal doctrine is only "officially compatibilist" and is actually "grounded in intuitions that are incompatibilist" and "libertarian"). Without taking a stance on whether our criminal law always should incorporate consideration of responsibility, it suffices to say that our criminal and juvenile law does consider both responsibility and consequentialist concerns, long has done so, and is unlikely to stop doing so. For an argument that law's treatment of children should instead be concerned only with prevention, a consequentialist concern, see Slobogin & Fondacaro, *supra* note 98 (manuscript at 36–43).

315 *See* Maroney, *supra* note 51, at 1392–99; Morse, *supra* note 59, at 400–03; Sapolsky, *supra* note 307, at 1793–94.

316 Legislatures also may be more open to adolescent brain science because they need not observe evidentiary standards for admissibility. *See, e.g.*, Brown & Murphy, *supra* note 36 (manuscript at 34–76) (discussing the wide variety of evidence law

Because legislatures unquestionably are in the best position to reverse the sweeping policy changes of the last two decades, they should be acknowledged as the primary audience. If developmental neuroscience is perceived as challenging the rules rather than their application, then it is best addressed directly to the primary rulemakers.[317]

To be sure, legislatures are a tough audience for this message. It is an unfortunate political reality that modern crime policy tends to be a one-way ratchet consistently trending in the direction of more punishment, less judicial discretion, and fewer chances for serious offenders, including young ones. But though such political forces remain strong, very recent developments at the state level show that directing juveniles to the legislatures is far from a fool's errand. Even before *Roper* some states apparently had relied in part on developmental neuroscience to eliminate the juvenile death penalty.[318] Since *Roper*, states have taken additional steps to roll back certain other punitive policies; and in so doing, some have looked to brain science. Washington State, for instance, in 2005 abolished mandatory sentencing of juveniles convicted as adults, relying in part on a legislative finding "'that emerging research on brain development indicates that adolescent brains, and thus adolescent intellectual and emotional capabili-

issues implicated by the possible introduction of fMRI images into a criminal trial). This greater openness increases the danger of the inaccuracy against which this Article warns. As shown in the previous Part, such arguments logically also would marginally inform legislatures' choices as to other adolescent rights and responsibilities. Advocates can determine for themselves whether such consideration poses undue risk of outcomes they consider normatively undesirable.

317 Even before *Roper* some commentators had thought the science more relevant to legislatures than to courts. *See* Boyle, *supra* note 62, at 38 (quoting Victor Streib as saying, "I don't think the brain research has any impact at all on the constitutional issue."). Some advocates have explicitly directed their efforts toward the legislatures. *See* Eileen Hirsch et al., *Raise the Age: Return 17-Year-Olds to Juvenile Court*, WIS. LAW., June 2007, at 15 (arguing in favor of a legislative proposal to raise the age of adult court jurisdiction in Wisconsin to eighteen); *Putting the Juvenile Back in Juvenile Justice*, *supra* note 7, at 7–9 (seeking to persuade North Carolina's legislature to reform its juvenile justice system); *see also* Fagan, *supra* note 70, at A7 ("As legislatures move toward placing increasingly younger teens in adult criminal court, social and biological evidence suggests moving in the other direction. It's time for the law to change course and follow the science.").

318 *See* Bower, *supra* note 227, at 299; Boyle, *supra* note 62, at 37 (citing victories in Indiana, South Dakota, and Wyoming); Moran, *supra* note 63, at 8. Not all such efforts were effective. *See* Pro-DeathPenalty.com, Legislation, http://prodeathpenalty.com/legislation.htm (last visited Oct. 2, 2009) (reporting comments of Linda Aguirre, a state senator in Arizona and sponsor of a 2004 bill to ban juvenile death penalty, who "hope[d] testimony about teenagers' brain development [would] change[ ] minds of colleagues," but acknowledged "that her bill . . . is dead").

ties, differ significantly from those of mature adults.'"[319] The Wisconsin Governor's Juvenile Justice Commission in early 2009 accorded "great weight" to brain science in recommending that the legislature raise the criminal-court jurisdictional age to eighteen.[320] Most recently, Texas abolished juvenile life without parole after legislative hearings that included testimony about juvenile brain development.[321]

Legislatures, though, are not the only relevant audience. Though it is unfashionable to say so, the courts also are entrusted with a policymaking role.[322] Not all of the extreme deference to legislatures reflected in the findings of the previous Part, therefore, is warranted. Courts must make judgments about youth as a class when they determine, for example, what mental states are "reasonable" for adolescents; whether the factual assumptions about foresight undergirding the felony-murder doctrine and accomplice liability are irrational when applied to youth; and whether youth are so different from adults as to warrant categorical protection under the Eighth Amendment from extreme, lifelong, irrevocable punishments. As such legal determinations inevitably include policy judgments, courts should feel free to take from developmental neuroscience the same modest messages as would a legislature.

Whether directed at courts or legislatures, though, adolescent brain science never should be the primary argument for juvenile justice reform. The real struggle lies elsewhere, and always will.

First, the persuasive power of developmental neuroscience always will be limited by confirmation biases. This may not seem obviously

319 *In re* Hegney, 158 P.3d 1193, 1208 (Wash. Ct. App. 2007) (quoting WASH. REV. CODE ANN. § 9.94A.540 (West 2003 & Supp. 2008) (historical and statutory notes). In North Carolina, advocates are engaged in an ongoing campaign—flavored with lessons from neuroscience—to raise the state's jurisdictional age to 18. *See* Birckhead, *supra* note 88, at 1463–64.

320 Statement Related to Wisconsin's Age of Adult Criminal Responsibility. Governor's Juvenile Justice Commission (Feb. 2009), *available at* http://njjn.org/media/resources/public/resource_961.pdf (listing eight relevant factors, of which "recent and evolving brain development research" was one).

321 *See Hearing on S.B. 839 Before the Comm. On Criminal Justice*, 2009 Leg., 81st Sess. (Tex. 2009) (testimony of Isela Gutiérrez, Juvenile Justice Initiative Director, Texas Criminal Justice Coalition), *available at* http://www.criminaljusticecoalition.org/files/userfiles/publicpolicy/SB_839_Testimony.pdf; Texas Legislature Online, 81(R) History for SB839, http://www.legis.state.tx.us/BillLookup/History.aspx?LegSess=81R&Bill=SB839.

322 *See* RICHARD A. POSNER, HOW JUDGES THINK 81–88 (2008) (stating that all judges, but particularly appellate judges are "*occasional legislators*" whose policymaking powers are greatest in "legalistically indeterminate" cases presenting a "zone of reasonableness" of interpretation).

so, as a number of recent studies show that people unduly credit neuroscientific explanations, even bad ones. Those studies suggest that adolescent brain science is uniquely persuasive.[323] This Article, though, suggests instead that such persuasiveness is in fact quite limited. As this author and other scholars elsewhere have demonstrated, legal decisionmakers (like all people) filter factual assertions, including scientific ones, through their prior beliefs, values, and commitments.[324] They tend to accept evidence as relevant and plausible where it aligns with implicit views and judgments and to reject it when it does not.[325] This Article strongly suggests that such bias is operational here. In many cases, this factual filtering is shaped by views based on record evidence. For instance, in the Delaware capital case, evidence of the defendant's high level of planning capacity reduced subsequent testimony about adolescent brains to "psychobabble" in the jurors' eyes.[326] In contrast, where sentencing courts were presented with credible evidence that particular defendants had matured, they saw in brain science a plausible explanation.[327] More abstract background beliefs, too, play a filtering role. Legal actors evaluate brain science through implicit political, cultural, or role-based perspectives that predispose them to favor or disfavor juveniles' claims.[328] That phenomenon may explain why juvenile advocates and defenders have tended wholeheartedly to embrace neuroscience and to take a broad view of its implications, while prosecutors have tended

323 *See* David P. McCabe & Alan D. Castel, *Seeing is Believing: The Effect of Brain Images on Judgments of Scientific Reasoning*, 107 COGNITION 343, 344 (2008); Deena Skolnick Weisberg et al., *The Seductive Allure of Neuroscience Explanations*, 20 J. COGNITIVE NEUROSCIENCE 470, 470 (2008) ("Explanations of psychological phenomena seem to generate more public interest when they contain neuroscientific information," and "irrelevant neuroscience information . . . may interfere with people's abilities to critically consider the underlying logic.").

324 *See* Dan M. Kahan et al., *Whose Eyes Are You Going to Believe?* Scott v. Harris *and the Perils of Cognitive Illiberalism*, 122 HARV. L. REV. 837, 842 (2009) ("[P]erceptions of fact are pervasively shaped by our commitments to shared but contested views of individual virtue and social justice."); Maroney, *supra* note 16, at 885–86.

325 Richard E. Redding, *How Common-Sense Psychology Can Inform Law and Psycholegal Research*, 5 U. CHI. L. SCH. ROUNDTABLE 107, 112–14 (1998) (noting that lawyers and judges frequently reject as invalid empirical psychological evidence where it conflicts with their "common sense" views).

326 State v. Jones, No. 9911016309, 2005 WL 950122, at *4 (Del. Super. Ct. Apr. 10, 2005).

327 *See supra* note 157 (discussing case in which a Delaware family court credited demonstrated rehabilitation of youthful sex offender).

328 *See, e.g.*, The Cultural Cognition Project at Yale Law School, http://culturalcognition.net (last visited Oct. 30, 2009) (collecting research on cultural cognition biases).

to take just the opposite tack, acknowledging the basic empirical points about structural maturation but displaying extreme skepticism as to its relevant behavioral implications.[329] Judges and juries, too, necessarily come to juvenile cases with implicit views. It is noteworthy that in every instance in which a court positively cited developmental neuroscience, it did so as part of a roster of reasons why it would reach a particular result. Not only were the other items on the roster sufficient to justify the result, the fact that the court credited them is one reason why it also found the science relevant. Steinberg recently has argued that the same phenomenon is true for legislatures, who "often look to science for evidence that supports a position they have take for other reasons."[330] Developmental neuroscience is not materially shifting beliefs and values; it is instead being read through the lens of those beliefs and values.

To make this point is not to cast aspersions on legal advocates and decisionmakers for coming to their tasks with views about juvenile offenders and their proper treatment, whether in the abstract or as to a specific person. Human beings necessarily have such views, and these views necessarily influence how facts are regarded. The point, rather, is that a clear-eyed recognition of the phenomenon should temper expectations. The value-confirmation bias confines the persuasive potential of adolescent brain science to cases of ambivalence or equipoise. In all other instances, it is likely to be understood in a manner conforming to conclusions to which the decisionmaker already is inclined.

The real task, then, for those seeking juvenile justice reform is to influence such beliefs, values, and inclinations directly rather than expect such influence to flow naturally from explanation of neuroscience. While there is no simple formula for that task, it has long been the bread and butter of juvenile justice scholarship and advocacy. It includes demonstrating the ways in which teens are developmentally distinct, but also educating the public and legal decisionmakers about the real-world effects of juvenile policy and

329 *See, e.g.*, *supra* note 8 (citing prosecutors' guides to rebutting juvenile brain science); *see also* Greene & Cohen, *supra* note 49, at 215 (arguing that Scott and Steinberg's enthusiasm for adolescent brain science is based on a "moral intuition," grounded in an unstated dualist mind-brain dichotomy, and is appealing to them because it "allows us to blame adolescents' brains instead of the adolescents themselves").

330 Steinberg, *supra* note 8 (manuscript at 20) ("[I]t is highly unlikely that lawmakers are going to rewrite statutes because of a new study of synaptic pruning, myelination, brain activity, or neurotransmission. If only scientists held such sway in our legislatures.").

what "works" from a utilitarian perspective. Such messages suffer from few of the vulnerabilities attending brain science. The strongest challenge to transfer schemes, for example, has nothing to do with the juvenile brain and everything to do with robust data consistently showing that transfer to adult court increases recidivism[331] and that many youth transferred to adult court are accused not of serious interpersonal violence but of property crimes.[332] The public might be even more moved if they fully understood how frequently incarceration with adults leads to physical and sexual abuse.[333] Strict "zero tolerance" policies in schools are becoming increasingly unpopular because they lead to patently absurd results.[334] Attitudes about JLWOP might be swayed by stories of youth who have grown into different people, and yet necessarily will die in prison;[335] juvenile sex offender registration may seem less palatable if the public were to learn about the range of youth on such lists (including, for example, preadolescents who engaged in inappropriate "play" and have responded well to treatment) and what registration does to their futures.[336]

Developmental principles, in short, tend to draw our attention inward. We need, too, to maintain a clear view of the world within which youth develop. Societal factors such as stable families, safe

331 Jeffrey Fagan, *The Comparative Advantage of Juvenile Versus Criminal Court Sanctions on Recidivism Among Adolescent Felony Offenders*, 18 LAW & POL'Y 77, 100 (1996); Angela McGowan et al., *Task Force on Community Preventive Services, Effects on Violence of Laws and Policies Facilitating the Transfer of Juveniles from the Juvenile to the Adult Justice System*, 32 AM. J. PREVENTATIVE MED. S7 (2007); Richard E. Redding, *Juvenile Transfer Laws: An Effective Deterrent to Delinquency?*, JUV. JUST. BULL. (Office of Juvenile Justice and Delinquency Prevention, U.S. Dep't of Justice, Washington, D.C.), Aug. 2008, *available at* http://www.ncjrs.gov/pdffiles1/ojjdp/220595.pdf.

332 *See* Deitch et al., *supra* note 272, at 30–31.

333 *See id.* at 55 (reporting studies showing much higher levels of physical and sexual abuse of youth held in adult, not juvenile, facilities); CAMPAIGN FOR YOUTH JUSTICE, JAILING JUVENILES 13 (2007), *available at* http://www.campaign4youthjustice.org/Downloads/NationalReportsArticles/CFYJ-Jailing_Juveniles_Report_2007-11-15.pdf.

334 *See* Safford Unified Sch. Dist. No. 1 v. Redding, 129 S. Ct. 2633, 2644 (2009) (invalidating strip search of middle-school girl on suspicion of possessing ibuprofen); Bob Herbert, Editorial, *6-Year-Olds Under Arrest*, N.Y. TIMES, Apr. 9, 2007, at A17 (reporting on a six-year-old girl who was arrested for throwing a tantrum during class); Ian Urbina, *Suspended Boy Back in School*, N.Y. TIMES, Oct. 15, 2009, at A22 (reporting on six-year-old boy whose suspension for bringing a Cub Scout tool to school prompted parental protest and changes to policy).

335 *See, e.g.*, EQUAL JUSTICE INITIATIVE, CRUEL AND UNUSUAL 25–33 (2007), *available at* http://eji.org/eji/files/20071017cruelandunusual.pdf.

336 *See, e.g.*, Maggie Jones, *How Can You Distinguish a Budding Pedophile from a Kid with Real Boundary Problems?*, N.Y. TIMES MAG., July 22, 2007, at 32, 39, 56.

housing, medical and mental health care, good schools, and economic opportunities—all subject to relatively direct societal control—will continue to be the most important contributors to juvenile offending, and they should continue to receive the lion's share of attention. This is particularly so because a disproportionate focus on the teen brain tends to support a false notion that teens' propensity to offend is "hard-wired," a view that not only makes societal reform seem pointless but, by implying the impossibility of deterrence, could support needless incapacitation of many youth until their brains "grow up."[337]

Educating the public and policymakers about teen brain development need not devolve into such counterproductive reductionism; instead, understanding the brain's "biological processes can actually enhance the importance of behavioral or social policy interventions" by highlighting the extraordinary impact of environment during a critical period of development.[338] Conceptualizing neuroscience as background rather than foreground keeps us collectively focused on creating the conditions necessary for youth to become healthy, productive adults—including those youth who have committed serious offenses.

337 Shepherd, *supra* note 88, at 52 (stating that a juvenile's behavioral traits are "literally hard-wired into the adolescent brain"); B. Smaller, *Cartoon*, THE NEW YORKER, Apr. 24, 2006, at 129 (showing parent disciplining teenage son by saying, "Young man, go to your room and stay there until your cerebral cortex matures"); *see also* Buss, *supra* note 13, at 509–10 (noting the danger that by deferring too heavily to developmental principles, including brain science, law "will lock in a developmental status quo," and asserting that "law can shape development instead of the other way around").

338 Dahl, *supra* note 273, at 4 ("Evidence of brain plasticity in the early years of life has not led to the conclusion that parenting and social experience are unimportant . . . . [We] are more likely to emphasize the value of social policies that protect and support infants and toddlers during this important period of brain development. There are . . . parallel opportunities [with] adolescent brain development."); *see* Aber Brief, *supra* note 128, at 25–29 (discussing young brain's extreme plasticity in response to environmental pressures, both positive and negative); *see also* Elizabeth Cauffman, *The Adolescent Brain: Excuse Versus Explanation*, 1021 ANNALS N.Y. ACAD. SCI. 160, 161 (2004) ("[W]e should view our findings as providing an *explanation* that may enable more effective means of encouraging healthy development."). Advocates, commentators, researchers, and experts frequently acknowledge the role of environment. *See, e.g.*, Ann S. Masten, *Regulatory Processes, Risk, and Resilience in Adolescent Development*, 1021 ANNALS N.Y. ACAD. SCI. 310, 312 (2004); RETHINKING THE JUVENILE, *supra* note 7, at 13–14. Nevertheless, that point is at risk of being overshadowed.

CONCLUSION

This Article tells a cautionary tale.[339] Relying aggressively on developmental neuroscience in legal theory and practice might wear out its welcome early, even though it now offers some law-relevant insights and in the future might offer more.[340] The courts' early cold shoulder shows this to be a real danger. Nor is such reliance necessary, as we already have all the information we need to construct a rational juvenile justice policy. Adolescent brain science does not provide an independent basis to recommit to traditional juvenile justice values; it merely reinforces the wisdom of doing so. The bulk of that wisdom comes not from understanding what is going on inside the teen brain but from understanding the impact of the legal and social environments we create for young people.

We need that wisdom now, as we are at a potentially momentous crossroad for juvenile justice. By removing the most extreme possible punishment for youth, *Roper* unquestionably has shifted the terms of debate. Recent legislative developments suggest that the states are, wisely, starting to roll back some of the policy changes of the 1990s.[341] Most Americans report being committed to second chances for youth.[342] Even recent fiscal challenges have wrought change, as states seek to avoid costly incapacitation if cheaper alternatives, like supervised release and family therapy, can be shown equally effective.[343]

339 *See* Munakata et al., *supra* note 1, at 125 box 3 (stating that "the excitement surrounding" developmental cognitive neuroscience, "and the potential applications of this research, increase the need for caution in interpreting study results and their implications").

340 STRAUCH, *supra* note 4, at 215 (quoting scholars worried that brain science will be reduced to a "fad" or allowed to narrow rather than broaden understanding of teen behavior).

341 *See, e.g.*, 2007 Conn. Acts 07-4 §§ 87–88 (Spec. Sess.) (raising jurisdictional limit of juvenile court to age eighteen).

342 *See* Elizabeth S. Scott et al., *Public Attitudes About the Culpability and Punishment of Youth Offenders*, 24 BEHAV. SCI. & L. 815, 827 (2006); CTR. FOR CHILDREN'S LAW & POLICY, POTENTIAL FOR CHANGE 3 (2007), *available at* http://www.macfound.org/atf/cf/%7Bb0386ce3-8b29-4162-8098-e466fb856794%7D/cclppollingfinal.pdf; Barry Krisberg & Susan Marchionna, *Attitudes of US Voters Toward Youth Crime and the Justice System*, FOCUS (Nat'l Council on Crime & Delinquency, Oakland, Cal.), Feb. 2007, at 3, *available at* http://www.nccd-crc.org/nccd/pubs/zogby_feb07.pdf.

343 *See* Editorial, *Money Saved, Safer Streets*, CHI. TRIB., Apr. 25, 2009, at 14 (noting that the "Redeploy Illinois" program "saves money and steers kids in the right direction" by keeping them out of more costly detention while simultaneously reducing recidivism); Jackie Nash, *Legislation Would Transform Ohio's Criminal Prosecution of Delinquent Children*, DAILY REP. (Atlanta, Ga.), July 7, 2009, at 1 (discussing H.B. 235, which would prioritize cheaper community-based treatment over incarceration). Fiscal challenges also have created opposing pressures, highlighting the need to focus policy-

These shifts may well portend a welcome new era in juvenile justice, one in which recommitment to the protection and rehabilitation of youth is the driving first principle. But if we move into that new era, it will not be because of adolescent brain science. To the extent that the science appears to promise transformation, it is a false promise.

makers on first principles even in hard economic times. *See* Kate Howard, Budget Cuts Could Hurt Nashville's Juvenile Court, TENNESSEAN, Mar. 23, 2009, at B1 (reporting that victims' rights group and a judge both warn of negative fallout from cuts to programming and probation services).