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Juvenile NeuroLaw: When It's Good It Is Very Good Indeed, and When It's Bad It's Horrid

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JUVENILE NEUROLAW: WHEN IT'S GOOD IT IS VERY GOOD INDEED, AND WHEN IT'S BAD IT'S HORRID

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I. INTRODUCTION

In a 2006 case before the Supreme Court, a Brief *Amici Curiae* referenced evidence from neuroscience to argue that adolescents lack the maturity to make decisions about their reproductive health care.[1] The case, *Ayotte v. Planned Parenthood*,[2] began in 2003 when Planned Parenthood of Northern New England filed a complaint against the recently passed New Hampshire Parental Notification Prior to Abortion Act,[3] which stated that minors must inform their parents before a pregnancy may be terminated.[4] Planned Parenthood won the case and the United States District Court for the District of New Hampshire declared the law unconstitutionally narrow;[5] a decision that the United States Court of Appeals for

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1. *See* Brief for U.S. Conference of Catholic Bishops & Roman Catholic Bishop of Manchester as Amici Curiae Supporting Petitioner, Ayotte v. Planned Parenthood of N. New Eng., 546 U.S. 320 (2006) (No. 04-1144); *see also* Ayotte v. Planned Parenthood of N. New Eng., 546 U.S. 320, 326–27 (2006) (quoting Hodgson v. Minnesota, 497 U.S. 417 (1990) (plurality opinion)) (stating that minors' "immaturity, inexperience, and lack of judgment may sometimes impair their ability to exercise their rights wisely").

2. 546 U.S. 320 (2006).

3. Planned Parenthood of N. New Eng. v. Heed, 296 F. Supp. 2d 59, 62 (D.N.H. 2003), *aff'd*, 390 F.3d 53 (1st Cir. 2004), *cert. granted sub nom.* Ayotte v. Planned Parenthood of N. New Eng., 544 U.S. 1048 (2005), *vacated*, 546 U.S. 320 (2006).

4. Parental Notification Prior to Abortion Act, N.H. REV. STAT. ANN. §§ 132:24–132:28 (LexisNexis Supp. 2006) (repealed 2007).

5. *Planned Parenthood of N. New Eng.*, 296 F. Supp. 2d at 67–68.

the First Circuit supported.[6] Ayotte appealed the case to the Supreme Court of the United States.[7] The United States Conference of Catholic Bishops and the Roman Catholic Bishop of Manchester submitted a Brief *Amici Curiae* in support of Ayotte, and in an attempt to show that it is necessary for adolescent females to consult with their parents before getting an abortion, the Brief discussed as precedent the "comparative immaturity" of juveniles cited in *Roper v. Simmons*:[8]

> Parental involvement is critical to ensure not only that the adolescent's choice is informed, but that it is freely made and not the result of coercion or duress. . . . These concerns are heightened for adolescents who, as this Court has recently observed, are more susceptible than adults to "outside pressure" and other "negative influences," and more likely than adults to make decisions that are "impetuous and ill-considered."[9]

Nevertheless, the Supreme Court declared that the law was unconstitutional when applied to the select few adolescents whose health could be harmed if prevented from having an abortion and required that, to be recognized as constitutional, the law must be broadened to include access to abortion without parental notification in the case of medical necessity.[10] In 2007, before the United States District Court for the District of New Hampshire could make a decision as to whether the law should be amended or struck down entirely, the New Hampshire state legislature repealed the Parental Notification Prior to Abortion Act.[11]

Despite the fact that the law never went into effect, this case marked the beginning of a potential wave of legislation aimed at restricting juveniles' already limited rights to direct their own health care.[12] Using *Roper v. Simmons* to argue anything about juveniles' ability to make reasonable health care decisions is akin to comparing apples and elephants—it is absurd. What these issues do have in

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6. Planned Parenthood of N. New Eng. v. Heed, 390 F.3d 53, 65 (1st Cir. 2004), *cert. granted sub nom.* Ayotte v. Planned Parenthood of N. New Eng., 544 U.S. 1048 (2005), *vacated,* 546 U.S. 320 (2006).

7. Ayotte v. Planned Parenthood of N. New Eng., 544 U.S. 1048 (2005), *vacated,* 546 U.S. 320 (2006).

8. 543 U.S. 551 (2005).

9. Brief for U.S. Conference of Catholic Bishops & Roman Catholic Bishop of Manchester as Amici Curiae Supporting Petitioner at 15, Ayotte v. Planned Parenthood of N. New Eng., 546 U.S. 320 (2006) (No. 04-1144) (quoting Roper v. Simmons, 543 U.S. 551, 569 (2005)).

10. *See Ayotte*, 546 U.S. at 327–28.

11. H.R. 184, 2007 Leg., Reg. Sess. (N.H. 2007) (enacted) (repealing the parental notification law). *See* Pam Belluck, *New Hampshire to Repeal Parental Notification Law*, N.Y. TIMES, June 8, 2007, at A22.

12. *See* Belluck, *supra* note 11 (observing that after the New Hampshire parental notification requirement was repealed, opponents of the repeal pledged to "push for a notification law when the legislature reconvenes").

common, however, is the use of evidence from developmental neuroscience.[13] The verdict in *Roper v. Simmons* was among the first cases where the Supreme Court considered evidence from neuroscience in making its decision about the relative maturity and culpability of juveniles who have committed violent crimes.[14]

Roper v. Simmons has been referred to as the "*Brown v. Board of Education* of Neurolaw."[15] It has set the precedent for courts and policy-makers to accept and consider neuroscience even in the most prominent and controversial cases.[16] Is this in the best interest of the law? In this essay, we will address this question by demonstrating that *Roper v. Simmons* is not an applicable precedent based on the history of parental consent laws.[17] We will further argue that the use of neuroscience in the courtroom must be done in a principled manner—keeping in mind that neuroscience cannot tell us much about individual people.[18] We will present instances where Neurolaw provides accurate and insightful information that *should* inform legal policy, but will also provide a strong cautionary note about using findings from neuroscience in ways that do not reflect the actual science and only serve to make the court unnecessarily skeptical of Neurolaw in general.[19] There are few better examples of this misuse than applying neuroscience to the law when it comes to a young woman's ability to make decisions about her own health care.[20]

II. THE EVOLUTION OF PARENTAL CONSENT LAWS

In the 1973 case *Roe v. Wade*,[21] the Supreme Court affirmed the right to an abortion for all women regardless of age.[22] However, since this time, the Court has

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13. Brief for U.S. Conference of Catholic Bishops & Roman Catholic Bishop of Manchester as Amici Curiae Supporting Petitioner at 15, Ayotte v. Planned Parenthood of N. New Eng., 546 U.S. 320 (2006) (No. 04-1144) (quoting Roper v. Simmons, 543 U.S. 551, 569 (2005) to argue that adolescents lack mature decision-making capabilities).

14. *Roper*, 543 U.S. at 569. *See also* Jeffrey Rosen, *The Brain on the Stand*, N.Y. TIMES, Mar. 11, 2007, § 6 (Magazine), at 49 (discussing the importance of *Roper* to neurolaw).

15. Rosen, *supra* note 14.

16. *See id.* (explaining that *Roper* had such a vast impact on neurolaw because it raised the question "of where to draw the line in considering neuroscience evidence as a legal mitigation or excuse"); *see also* Graham v. Florida, 130 S. Ct. 2011, 2026 (2010) (relying on the neuroscience studies used in *Roper* to abolish life without parole for non-homicidal offenses committed by juveniles); Terry Maroney, *The False Promise of Adolescent Brain Science in Juvenile Justice*, 85 NOTRE DAME L. REV. 89, 167 (2009) (discussing how policy-makers can use neuroscience in developing laws "because neuroscience generally corroborates the beliefs traditionally undergirding" the juvenile justice system).

17. *See infra* Part II–III.

18. *See infra* Part V.

19. *See infra* Part V–VI.

20. *See infra* Part V; *see, e.g.*, ALA. CODE § 26-21-33 (LexisNexis 2009); GA. CODE ANN. § 15-11-111 (2008); IND. CODE ANN. § 16-34-2-4 (LexisNexis 1993) (requiring parental consent or notification before performing an abortion on a minor).

21. 410 U.S. 113 (1973).

continually allowed states to restrict the ability of women under the age of eighteen to exert this right.[23] Massachusetts was among the first to enact a law requiring parental consent for unmarried minors seeking abortions.[24] Parents' Aid Society (an abortion counseling group), four unnamed pregnant minor women, and William R. Baird filed a class action challenging the statute as violating the Due Process and Equal Protection Clauses of the Fourteenth Amendment.[25] After a complicated procedural history that saw the Massachusetts law repeatedly defeated in federal courts,[26] the State of Massachusetts petitioned the Supreme Court for certiorari.[27] The Supreme Court granted cert and held, consistent with its earlier decision in *Planned Parenthood of Central Missouri v. Danforth*,[28] that the statute was unconstitutional because it created an "absolute parental veto" over the decision of any minor to terminate a pregnancy.[29] The Supreme Court reasoned that "neither the Fourteenth Amendment nor the Bill of Rights is for adults alone" and instead it applies to all people.[30] Yet it balanced this recognition against three countervailing factors: children are unable to "make critical decisions in an informed, mature manner"; parents' roles in directing the upbringing of their own children; and "the peculiar vulnerability of children" themselves.[31] After denying the constitutionality of the Massachusetts consent law, the Court suggested a new provision aimed at balancing these three considerations.[32] The provision recognized state and parental interests in guiding potentially vulnerable minors by permitting states to require parental consent for juvenile terminations.[33] It also required states with parental

22. *Id.* at 164–65. The Court balanced a woman's right with the state's interest in the health of the mother and the potential human life. In doing so, the Court permits the state to restrict the woman's right to an abortion in later trimesters. *Id.*

23. *See* Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 841 (1992) (upholding the parental consent requirement for minors seeking abortions); Rust v. Sullivan, 500 U.S. 173, 184 (1991) (upholding Title X of the Public Health Service Act, Pub. L. 91-572, 84 Stat. 1506 (1970) (codified as amended at 42 U.S.C. §§ 300–300a-6 (2006), which prohibits the allocation of federal funds to family planning "programs where abortion is a method of family planning"); *see also* Hodgson v. Minnesota, 497 U.S. 417 (1990) (plurality opinion); Bellotti v. Baird, 443 U.S. 622 (1979) (Baird II) (reconsidering Baird I after the Supreme Court remanded the case in 1976); Bellotti v. Baird, 428 U.S. 132 (1976) (Baird I); Baird v. Bellotti, 393 F. Supp. 847 (D. Mass. 1975), *vacated by*, 428 U.S. 132 (1976).

24. MASS. GEN. LAWS ANN. ch. 112, § 1S (West 2003) (explaining that women under eighteen years of age who want to have an abortion must either obtain parental consent or prove to a judge that an abortion is in her best interest) (originally codified at MASS. GEN. LAWS ANN. ch. 112, § 1P).

25. *Baird*, 428 U.S. at 132.

26. *Id.* at 1006. *See also* Baird v. Bellotti, 450 F. Supp. 997 (1978) (reconsidering the case on remand from the Supreme Court and reaffirming its decision that the statute is unconstitutional).

27. Bellotti v. Baird, 443 US 622, 633 (1979) (Baird II).

28. 428 U.S. 52 (1976).

29. Baird II, 443 U.S. at 639–40.

30. *Id.* at 633 (citing *In re* Gault, 387 U.S. 1 (1967)).

31. *Id.* at 634–37.

32. *See id.* at 643 (requiring that states "provide an alternative procedure whereby authorization for the abortion can be obtained" without parental consent).

33. *Id.*

consent laws to provide a judicial bypass to parental consent under certain conditions.[34]

In addition, in the 1990 Supreme Court case *Hodgson v. Minnesota*, gynecologist Dr. Jane Hodgson and another doctor asserted that a Minnesota law, which prohibited a minor from terminating her pregnancy unless both parents were informed, violated the Minnesota and U.S. constitutions.[35] After some deliberation, the Supreme Court deemed the law constitutional only when it included the judicial bypass.[36] The judicial bypass stated that if a minor proved to be mature and able to give informed consent, or if the termination of a pregnancy without parental notification was in the minor's best interest, a judge could ratify the minor's request for abortion.[37] The Court's decision was informed by evidence that the American Psychological Association presented, which maintained that minors should not be required to notify their parents in order to terminate a pregnancy, because adolescent females are mature enough to make the decision on their own.[38] In addition, the American Academy of Pediatrics et al. submitted evidence explaining how the parental notification laws often do more harm than good by delaying adolescents from seeking access to "necessary medical care."[39]

Supporters of parental involvement laws accept that some minors are not able to seek help from their parents because of potential abuse, conflict, or inability to contact them; and they argue that the judicial bypass option gives these minors a fair alternative.[40] Unfortunately, this compromise for a judicial bypass has proven unsatisfactory. Helena Silverstein, who conducted an in-depth survey of courts in Alabama, Pennsylvania, and Tennessee, sums up her distressing findings about the consequences of the so-called compromise:

> [I]n many cases court personnel charged with implementing the bypass option are simply unaware that it exists. Occasionally they are not merely unaware of their responsibility to handle bypass requests but convinced that they have no such responsibility. Even where courts are aware of their responsibility, administrative difficulties

34. *Id.* The Court noted that the judicial bypass should be available for a minor who demonstrates that she is mature enough to make the decision, or that the abortion is in her best interest. *Id.*

35. Hodgson v. Minnesota, 497 U.S. 417, 429 (1990) (plurality opinion).

36. *Id.* at 455 (Stevens, J., dissenting).

37. *Id.* at 427 (majority opinion).

38. *See* Brief for American Psychological Ass'n as Amicus Curiae Supporting Appellees & Cross-Appellants at 6–10, Hodgson v. Minnesota, 497 U.S. 417 (1990) (No. 86-5423-MN/No. 86-5431-MN) ("[B]y mid-adolescence (14-15) the great majority of adolescents of average intelligence do not differ from adults in their capacities to understand and reason about medical and psychological treatment alternatives . . .").

39. *See* Brief from American Academy of Pediatrics et al. as Amici Curiae Supporting Appellees & Cross Respondents at 13, Hodgson v. Minnesota, 497 U.S. 417 (1990) (Nos. 88-805 and 88-1309).

40. Comm. on Adolescence, *The Adolescent's Right to Confidential Care When Considering Abortion*, 97 PEDIATRICS 746, 749 (1996).

> often get in the way of implementation. Knowledgeable parties are often unreachable for hours, days, and sometimes even weeks. Political and religious views also breed implementation peculiarities, with some judges refusing to hear bypass petitions, others candidly stating that they will deny such petitions, and still others engaging in practices during hearings that aggressively aim to persuade young women to forgo abortions.[41]

Parental involvement laws are constitutional so long as they do not present an "undue burden" on women's ability to exercise their rights.[42] As discussed above, in practice, the judicial bypass option does not meet this criterion.[43] Girls face humiliation, are forced to testify about their sex lives, put themselves at risk of public exposure, and are subject to an added delay that puts their health at risk.[44]

More recently, those seeking to increase the scope of parental notification laws, such as *Ayotte v. Planned Parenthood*, have attempted to indirectly introduce neuroscientific evidence supporting the idea that juveniles are not capable of making autonomous decisions about their health care.[45] As described in the following section, this "precedent setting" evidence comes from the Supreme Court's decision to ban the execution of juveniles for violent crimes committed under the age of eighteen.[46] There are a number of factors that make this an inappropriate precedent. These are described in the sections that follow.

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41. HELENA SILVERSTEIN, GIRLS ON THE STAND: HOW COURTS FAIL PREGNANT MINORS 17 (2007). One of the commonplace practices employed to persuade minors to forgo abortion is mandating pro-life counseling with crisis pregnancy centers before a bypass will be granted. *Id.* at 100. In these sessions, girls are not only counseled about their options, but are told about Jesus, read Bible scriptures, hear testimony about being saved, and are asked about their personal relationship with God. *Id.* at 108–09. One director of a center explained how they ask women to watch a video that graphically "depicts the abortion procedure." *Id.* at 111. Silverstein reflected on these circumstances, and stated "[B]eing mature does not mean being invulnerable, and only the most tenacious minor is likely to emerge unscathed from a bypass process that is coupled with the counseling of the type described . . . ." *Id.* at 113. Even if all of the girls seeking bypasses succeed, that does not mean they have not been harmed.

42. Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 876–77 (1992).

43. *See* SILVERSTEIN, *supra* note 41, at 100, 113 (describing the burdens judges place on minors seeking the judicial bypass exception to the parental consent requirement); *see also* Carol Sanger, *Decisional Dignity: Teenage Abortion, Bypass Hearings, and the Misuse of Law*, 18 COLUM. J. GENDER & L. 409, 437–56 (2009) (explaining that minors are harmed by the judicial bypass process in various ways); Elizabeth A. Schneider, Comment, *Workability of the Undue Burden Test*, 66 TEMP. L. REV. 1003, 1022 (1993) (explaining Justice Steven's opinion in *Casey*, where he expressed his belief that the judicial bypass option did not save the parental consent requirement from being unduly burdensome for the minor).

44. Sanger, *supra* note 43, at 444–45.

45. Brief for U.S. Conference of Catholic Bishops & Roman Catholic Bishop of Manchester as Amici Curiae Supporting Petitioner at 15, Ayotte v. Planned Parenthood of N. New Eng., 546 U.S. 320 (2006) (No. 04-1144) (quoting Roper v. Simmons, 543 U.S. 551, 569 (2005)).

46. Roper v. Simmons, 543 U.S. 551, 578 (2005).

III. CAN ROPER V. SIMMONS TELL US ANYTHING ABOUT THE RIGHT TO CHOOSE?

A. Examining the Precedent: Roper v. Simmons

In the 2005 case *Roper v. Simmons*, Christopher Simmons faced the death penalty for the murder of Shirley Cook, which he committed in 1993 at the age of seventeen.[47] In a landmark decision of the same year, the Supreme Court decided to change the age that individuals could by executed for capital crimes from sixteen to eighteen, thereby abolishing the juvenile death penalty and commuting Simmons' sentence from the death penalty to life in prison without the possibility of parole.[48] The Court held that executing adolescent offenders violated the Eighth Amendment's "cruel and unusual punishment" clause.[49] The Court reasoned that adolescents have a harder time controlling their impulses, are more susceptible to peer influence, and do not yet have a fully formed identity.[50] In other words, the developmental stage of adolescence mitigates the responsibility of those under the age of eighteen, and executing such offenders goes against "the evolving standards of decency that mark the progress of a maturing society."[51]

The Supreme Court's decision, to hold unconstitutional the execution of offenders who were minors when they committed their crimes, was influenced by evidence from neuroscience.[52] In making their decision, the Court referred to amicus briefs from, among others, the American Psychological Association (APA) and American Medical Association.[53] Both organizations supported Simmons, and utilized, in part, studies on the adolescent brain.[54] They argued that the adolescent brain is not yet wired like that of an adult, and as a result, adolescents should be held less responsible for their actions than mature adults.[55]

This research illustrated that the human brain is still maturing during adolescence and into the third decade of life.[56] Relying in part on this evidence to

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47. *See* State v. Simmons, 944 S.W.2d 165, 169, 191 (Mo. 1997), *cert granted sub nom.* Roper v. Simmons, 540 U.S. 1160 (2004), *aff'd*, 543 U.S. 551 (2005).

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

49. *Id.* at 608–09.

50. *Id.* at 569–70.

51. *See id.* at 560–61 (citing Trop v. Dulles, 356 U.S. 86, 100–01 (1958) (plurality opinion)) (defining "cruel and unusual" as neither precise nor static, but in alignment with changes of society).

52. *Roper*, 543 U.S. at 569–70.

53. *See id.* at 596, 617–18 (mentioning the amicus briefs which argued that adolescents lack the ability to "take moral responsibility for their decisions").

54. *See* Brief for American Psychological Ass'n & Missouri Psychological Ass'n as Amici Curiae Supporting Respondent at 4–5, 30, Roper v. Simons, 543 U.S. 551 (2005) (No. 03-633); *see also* Brief for American Medical Ass'n et al. as Amici Curiae Supporting Respondent at 2, 5–6, Roper v. Simons, 543 U.S. 551 (2005) (No. 03-633).

55. Brief for American Psychological Ass'n & Missouri Psychological Ass'n, *supra* note 54, at 4; Brief for American Medical Ass'n et al, *supra* note 54, at 4–5.

56. *Roper*, 543 U.S. at 569 (accepting that "[a] lack of maturity and an underdeveloped sense of responsibility are found in youth more often than in adults and are more understandable among the young") (quoting Johnson v. Texas, 509 U.S. 350, 367 (1993)); *see also* Jay N. Giedd et al., *Brain*

support the idea that adolescents are less mature than adults, the Court sided with the respondent, Simmons, and abolished the juvenile death penalty.[57] It is noteworthy that the Court's consideration of neuroscientific evidence was only one factor in their decision, and in fact a relatively minor one.[58] The importance of the role of neuroscience in this decision should not be exaggerated simply to support restrictions on adolescents' exercise of their civil rights.

B. Applying Roper v. Simmons *to Health Care Decision Making*

While the conclusions about the character and maturity of adolescents might have been warranted in *Roper v. Simmons*, they are virtually irrelevant to ascertaining a juvenile's ability to make autonomous health care decisions. As the country continues to argue about women's reproductive rights and services, juvenile girls' autonomy will be a major health care issue. As demonstrated in *Hodgson v. Minnesota* and *Roper v. Simmons*, courts have already considered new research in developmental science,[59] and it is not surprising that such research has been used in the discussion of adolescent girls' decision-making skills, such as in *Ayotte v. Planned Parenthood*.[60] At the forefront of these new discoveries are insights into the developing adolescent brain. That said, the neuroscientific data submitted to the court in *Roper v. Simmons* are simply not relevant to the discussion of minors' ability to make autonomous decisions about their health care.[61] As this section discusses, there is a clear distinction between committing a crime and making a health care choice.

Development During Childhood and Adolescence: A Longitudinal MRI Study, 2 NATURE NEUROSCIENCE 861, 861 (1999) (using pediatric neuroimaging to identify changes in gray and white matter in children and youth); Elizabeth R. Sowell et al., In Vivo *Evidence for Post-Adolescent Brain Maturation in Frontal and Striatal Regions*, 2 NATURE NEUROSCIENCE 859, 859 (1999) (studying spatial and temporal brain mapping in adolescents and young adults); *see generally* Nitin Gogtay et al., *Dynamic Mapping of Human Cortical Development During Childhood Through Early Adulthood*, 101 PROC. NAT'L ACAD. SCI. 8174 (2004).

57. *Roper*, 543 U.S. at 569–70, 574–75.

58. *Id.* at 569–71 (discussing evidence which demonstrates the general developmental differences between minors and adults).

59. *Id.* at 569–70; Hodgson v. Minnesota, 497 U.S. 417, 438–39, 454 n.38 (1990) (plurality opinion); Brief for American Psychological Ass'n, *supra* note 38, at 6–10.

60. Brief for U.S. Conference of Catholic Bishops & Roman Catholic Bishop of Manchester as Amici Curiae Supporting Petitioner at 15, Ayotte v. Planned Parenthood of N. New Eng., 546 U.S. 320 (2006) (No. 04-1144) (quoting Roper v. Simmons, 543 U.S. 551, 569 (2005). *See also* 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. PSYCHOL. 583, 584 (2009) (discussing how in *Ayotte*, opponents of adolescents' autonomous abortion rights had used research to argue that youths were more likely to be more susceptible to outside influences compared to adults).

61. *Cf.* Steinberg et al., *supra* note 60, at 586 ("In general . . . when contemplating an abortion, an adolescent has time to deliberate before making a final choice and has an opportunity to consult with an expert," whereas decisions before criminal offenses by adolescents are "characterized by heightened emotional arousal, time pressure, and peer influence.").

The American Psychological Association submitted amici curiae briefs in both *Hodgson v. Minnesota* (1990)[62] and *Roper v. Simmons* (2005).[63] In the first case, which concerned a minor's right to get an abortion without involving her parents, the APA compiled evidence in support of minors' competence and mature decision-making skills.[64] In contrast, in the juvenile death penalty case, the APA argued that youth should be a mitigating factor in regards to legal responsibility for a crime due to minors' developmental immaturity.[65] The APA was accused of "flip-flopping," or "trying to have their scientific cake and eat it too."[66] However, by taking a closer look at the kinds of decisions relevant to each case, it becomes apparent that it is entirely possible that adolescents are mature enough to make informed decisions about their own health care while still being too immature to be completely responsible for controlling their impulsive behavior.

A popular theory in developmental neuropsychology is that an adolescent's tendency for risk-taking is due to psychosocial immaturity that influences their ability to self-regulate.[67] Psychosocial immaturity refers to adolescents' ability to coordinate their emotions, social interactions, and decisions.[68] So, while most adolescents understand the consequences of their actions and have cognitive abilities that are similar to those of an adult, in certain situations they have a harder time using this knowledge and controlling their impulses.[69] When there is an opportunity for juveniles to engage in risky behavior, the benefits, including peer approval and a neurochemically driven feeling of pleasure,[70] often outweigh the costs that seem more distant and unimportant.[71]

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62. *See generally* Brief for American Psychological Ass'n, *supra* note 38.

63. *See generally* Brief for American Psychological Ass'n & Missouri Psychological Ass'n, *supra* note 54.

64. Brief for American Psychological Ass'n, *supra* note 38, at 8–10.

65. Brief for American Psychological Ass'n & Missouri Psychological Ass'n, *supra* note 54, at 13–14.

66. *See* Steinberg et al., *supra* note 60, at 584–85.

67. *See* Laurence Steinberg, *Risk Taking in Adolescence: What Changes, and Why?*, 1021 ANNALS N.Y. ACAD. SCI. 51, 54 (2004) (noting that adolescents' prolonged development in the ability to self-regulate contributes to increased risk-taking).

68. *See* Laurence Steinberg & Elizabeth S. Scott, *Less Guilty by Reason of Adolescence: Developmental Immaturity, Diminished Responsibility, and the Juvenile Death Penalty*, 58 AM. PSYCHOL. 1009, 1012 (2003).

69. *See id*; Steinberg, *supra* 67, at 52–54

70. *See* Matthew J. Fuxjager et al., *Winning Territorial Disputes Selectively Enhances Androgen Sensitivity in Neural Pathways Related to Motivation and Social Aggression*, 107 PROC. NAT'L ACAD. SCI. 12393, 12396 (2010). In this study, researchers demonstrate that winning aggressive encounters increases activity in the nucleus accumbens, an area of the brain that mediates motivation and feelings of reward. *Id.* This helps explain why winning aggressive encounters can enhance the desire to seek out additional aggressive encounters. *Id.* In other words, the nucleus accumbens is involved in motivating and reinforcing this pattern of behavior. *Id.*

71. *See* Steinberg, *supra* note 67, at 55 (noting that adolescents have difficulty comprehending the future consequences of their actions and are more oriented to the present than the future).

One of the central arguments made by the APA in its amicus brief to the Supreme Court in *Roper v. Simmons* is that "neuropsychological research demonstrates that the adolescent brain has not reached adult maturity."[72] This argument is supported by consistent evidence from several studies of brain structure and function, all demonstrating prolonged development of the structure and function of the prefrontal cortex.[73] In arguing against executing juvenile offenders, the APA focused on the gradual maturation of the frontal lobes, which are known to be critical to "foresight, strategic thinking, and risk management."[74] If the adolescent brain, particularly the regions known to be involved in foresight and impulse control, has not yet reached the structural and functional maturity of the average adult, it is logical to hold adolescents less responsible for their bad decisions.[75] This is especially true in cases involving criminal behavior, where the neuroscience findings above agree nicely with existing behavioral studies.[76] In their brief to the Court, the APA offered ample evidence of "heightened risk-taking and even criminal conduct which are moderated or eliminated by the individual in adulthood."[77] It is also the case that the prevalence and incidence of crime peaks during adolescence.[78] Finally, studies indicate that it is statistically normative for adolescents to participate in illegal activity.[79] In other words, it is absolutely *normal* for adolescents to take risks or make impulsive decisions that amount to or result in some sort of criminal behavior. Stealing, speeding, and accepting a drink at a party are all examples of common impulsive and illegal behavior.[80] Most of this behavior decreases or stops completely during adulthood.[81] Adolescent immaturity in this context is supported not only by neuroscience research but also by studies of

72. Brief for the American Psychological Ass'n & the Missouri Psychological Ass'n, *supra* note 54, at 9.

73. *See, e.g.*, Giedd et al., *supra* note 56, at 862–63 (reporting a study of 145 children and adolescents scanned up to five times over approximately ten years and explaining the many changes the adolescent brain undergoes until reaching full development); *see also* Gogtay et al., *supra* note 56, at 8176–77 (noting the stages of brain maturity); Sowell et al., *supra* note 56, at 8821 (revealing the finding that there is "a dramatic increase in local gray matter density loss in the frontal lobes" between adolescence and adulthood).

74. Brief for the American Psychological Ass'n & Missouri Psychological Ass'n, *supra* note 54, at 10.

75. *Id.* at 2.

76. *Id.* at 4.

77. *Id.* at 5.

78. *See id.* at 6 (revealing that crime among juveniles increases gradually until the age of eighteen).

79. *See* Steinberg & Scott, *supra* note 68, at 1012–13 (noting that research supports the notion that adolescents engage in more risk-taking than adults which contributes to youth choice to engage in criminal behavior).

80. *See* Steinberg, *supra* note 67, at 53 (noting that criminal behavior and drinking are risk taking activities).

81. *See* Steinberg & Scott, *supra* note 68, at 1012 (noting that adolescents differ from adults in their assessment of and attitude toward risk).

behavior that are consistent with the findings about the brain. This sort of behavioral neuroscience is directly relevant to the *Roper v. Simmons* verdict.[82]

The differences between adolescent decision making in committing a crime and making health care decisions is clear when comparing the mental processes of the two choices. Throwing a bottle out from a moving car and breaking a neighbor's windshield; succumbing to peer pressure to get drunk at a party; giving in to your date and having unprotected sex; these are all examples of impulsive decisions.[83] These involve rash, highly impulsive actions.[84] They also involve intense peer influence and lack of information from other sources.[85] In these situations, teens are forced to make quick decisions and are driven by a physiological system that rewards them for risky behavior.[86] Deciding to get an abortion two weeks after you realize that having sex has resulted in an unintended pregnancy is not an impulsive decision,[87] and it differs enormously from the first three examples. There is no social or neurochemical reward following an abortion.[88] Setting up appointments, listening to the mandated counseling, and waiting the often mandatory period of time between visiting a clinic and getting the procedure all lead to a decision that takes time and in doing so eliminates the possibility of impulsive decision making.[89]

In addition, when the behavior of juvenile girls is examined, it is clear that their ability to make competent decisions about health care does not differ significantly from that of women over eighteen.[90] For example, when women are asked to consider their options in actual treatment settings at the time of their

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

83. *See* Steinberg, *supra* note 67, at 53.

84. *See id.* (noting the prevalence of risky or potentially risky situations that adolescents often encounter in the real world); *see also* Steinberg et al., *supra* note 60, at 586.

85. Steinberg et al., *supra* note 61, at 586, 592. *See also* Tom Luster & Stephen A. Small, *Factors Associated with Sexual Risk-Taking Behaviors Among Adolescents*, 56 J. MARRIAGE & FAM. 622, 623 (1994) (discussing the effect of lack of knowledge about sex and contraception on increased sexual risk taking behaviors among adolescents); Steinberg, *supra* note 67, at 56 (explaining how adolescent criminal behavior and under-age drinking is more likely to occur in groups).

86. Steinberg, *supra* note 67, at 53 (noting that the emotional backdrop for adolescent risk taking is euphoria).

87. Steinberg et al., *supra* note 60, at 586.

88. *Cf. id.* (differentiating abortion from other "typical adolescent criminal offense" based on the characterized emotional arousal).

89. *Id.*

90. *See, e.g.*, Catherine C. Lewis, *A Comparison of Minors' and Adults' Pregnancy Decisions*, 50 AM. J. ORTHOPSYCHIATRY 446, 451 (1980) (noting that in one study a sample of minors seeking pregnancy tests did "not differ from adults in their knowledge of the legality and confidentiality of abortion"); *see also* Bruce Ambuel & Julian Rappaport, *Developmental Trends in Adolescents' Psychological and Legal Competence to Consent to Abortion*, 16 LAW & HUM. BEHAV. 129, 150 (1992) ("[M]ost minors are as competent as legal adults to make treatment decisions with respect to abortion . . . ."); Lois A. Weithorn & Susan B. Campbell, *The Competency of Children and Adolescents to Make Informed Treatment Decisions*, 53 CHILD DEV. 1589, 1595 (1982) (finding that fourteen-year-olds had equal competency levels as adults in certain situations).

pregnancy tests, unmarried minors ages thirteen to seventeen respond similarly to unmarried women ages eighteen to twenty-five on their knowledge of pregnancy related laws, their decision to follow through with the pregnancy, and the consequences and considerations that could affect their choice.[91] Further, the responses of minors did not differ significantly from adults on additional elements such as positive emotions associated with mothering, financial concerns, social stigma, and future goals.[92]

The act of having sex at fifteen may be impulsive (or coerced) but the rash decisions end here. Decisions about reproductive health are anything but impulsive.[93] Obtaining and consistently using birth control, being fitted for a diaphragm, as well as terminating an unwanted pregnancy all require a young woman to "sit" with her decision for a period of days or even weeks.[94] Given the enormity and complexity of the processes that a juvenile must endure in order to obtain safe reproductive care, impulsivity is simply impossible. As the next section discusses, it is critical to keep in mind that once a girl has gone through puberty not only is she capable of reproduction, but puberty also forever changes the structure and function of her brain.

IV. THE RELEVANCE OF SEX DIFFERENCES

Prior to the onset of puberty, girls and boys are likely to have more differences in behavior within their own sex than between the two sexes.[95] While there are certainly some young children who engage in more intense gendered behavior than others, there are plenty who are fine to sit somewhere in the middle.[96] When the biology of puberty begins, the differences between boys and girls are intentionally (from an evolutionary standpoint) exaggerated to encourage mating

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91. *See* Lewis, *supra* note 90, at 447, 452.

92. *Id.* at 449. In this study, 25% of minors and 35% of adults said that mothering concerns affected their choice of abortion. In addition, 44% of minors and 38% of adults said that financial concerns affected their decision. Likewise, 44% of minors and 54% of adults considered the effect an abortion would have on life-goals while 19% of minors and 12% of adults considered the social stigma of their decision. *Id.*

93. *See* Steinberg et al., *supra* note 60, at 586.

94. *Id. See, e.g.*, KAN. STAT. ANN. § 65-6709 (2002 & Supp. 2010); MICH. COMP. LAWS § 333.17015(3) (West 2008) (requiring a doctor to wait at least twenty-four hours after first meeting with the patient before performing the abortion).

95. *See* Valerie E. Whiffen & Natasha Demidenko, *Mood Disturbance Across the Life Span*, *in* HANDBOOK OF GIRLS' AND WOMEN'S PSYCHOLOGICAL HEALTH 51, 52 (Judith Worell & Carol D. Goodheart eds., 2006) (finding that the "gender gap first emerges in early adolescence"); *cf.* A. Angold et al., *Puberty and Depression: The Roles of Age, Pubertal Status and Pubertal Timing*, 28 PSYCHOL. MED. 51, 55 (1998) (finding that at or above the age of thirteen, girls had consistently higher rates of depression than boys, which was relatively similar at earlier ages).

96. *See* Janet Shibley Hyde, *The Gender Similarities Hypothesis*, 60 AM. PSYCHOL. 581, 586 (2005) ("[M]en and women, as well as boys and girls, are more alike than they are different.").

and reproduction.[97] In present times, however, these biological changes take place in a socio-cultural context that exerts a great deal of influence on both the brain and behavior of the emerging adolescent.[98] Puberty is the biological event, and adolescence is the socio-cultural expression of this biological event.[99] As such, in order to appreciate the biology, one must consider the context. Much in the same way we learn the language we are exposed to at birth, we learn the social rules of adulthood through our experience during adolescence.[100]

The hormonal changes that females experience during puberty produce discernable neurological maturation.[101] The two most widely noted neurological changes are, relative to boys, accelerated maturation of the hippocampus and the prefrontal cortex.[102] These structures are critical for thinking, memory and planning.[103] Practically, this means that once they have reached puberty, females are much more likely to have a biological "leg up" (relative to their male counterparts) when it comes to reasoning, planning, and complex decision making.[104] Adolescent females consistently perform better than same-age males on tasks that require them to foresee potential consequence of their actions.[105] From an evolutionary standpoint, this sex difference in the timing of brain development makes sense: the cognitive and social skills required to successfully give birth and

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97. *See generally* CHARLES DARWIN, THE DESCENT OF MAN AND SELECTION IN RELATION TO SEX (1872) (hypothesizing that sex differences, which emerge during puberty, can be explained by the need to recognize the opposite sex, and in doing so enables competition within a species for mates and furthers the process of natural selection).

98. Avshalom Caspi et al., *Unraveling Girls' Delinquency: Biological, Dispositional, and Contextual Contributions to Adolescent Misbehavior*, 29 DEV. PSYCHOL. 19, 20 (1993).

99. Abigail A. Baird, *The Terrible Twelves*, *in* DEVELOPMENTAL SOCIAL COGNITIVE NEUROSCIENCE 191, 192 (Philip D. Zelazo et al. eds., 2010). *See also* Ronald E. Dahl, *Adolescent Brain Development: A Period of Vulnerabilities and Opportunities*, 1021 ANN. N.Y. ACAD. SCI. 1, 9–10 (2004) (explaining that puberty is the process by which males and females undergo physical maturation whereas adolescence is the time period by which adolescents grow and mature into their societal roles).

100. Baird, *supra* note, 99, at 194; Dahl, *supra* note 99, at 10.

101. *See* Whiffen & Demidenko, *supra* note 95, at 52.

102. Baird, *supra* note 99, at 195–96. Giedd et al., *supra* note 56, at 863.

103. *See* Baird, *supra* note 99at 197; *see also* FRANCESCO P. BATTAGLIA ET AL., SPATIAL DECISIONS AND NEURONAL ACTIVITY IN HIPPOCAMPAL PROJECTION ZONES IN PREFONTRAL CORTEX AND STRIATUM, IN HIPPOCAMPAL PLACE FIELDS: RELEVANCE TO LEARNING AND MEMORY 289, 290 (Sheri J. Y. Mizumori ed., 2008) (discussing how the hippocampal system is responsible for "process[ing] a large amount of relational information, and reconstruct[ing] previous episodes that may be relevant for shaping the decision at hand").

104. *See, e.g.*, Baird, *supra* note 99, at 196, 198 (finding that density of gray matter of both frontal and parietal lobes peaks at an earlier point for girls than for boys, and that the decline of gray matter in prefrontal cortex in adolescence has been taken to be a marker of neural maturation); Giedd et al., *supra* note 56, at 863 (finding that the frontal and parietal gray matter reaches its highest point about one year earlier in girls than boys).

105. Laurence Steinberg et al., *Age Differences in Future Orientation and Delay Discounting*, 80 CHILD DEV. 28, 36 (2009) (finding that females performed better than males in planning ahead, time perspective, and anticipation of future consequences).

raise a child ideally "takes a village,"[106] but it can be done by a single young woman with a brain that has undergone the hormonal transformation of puberty and learned from the experience of adolescence.[107] This argument also supports the idea that a young woman who has undergone puberty (a pre-requisite to pregnancy) is capable of making a mature and autonomous decision about her own body.[108] This does not preclude the need to consider each individual's circumstance, nor does it suggest that a young woman making such a decision would not benefit from counseling and social support.[109]

Differences in adolescent behavior as a function of gender are also a critical differentiator of the death penalty versus reproductive rights argument. Underscoring the baseless use of the *Roper v. Simmons* verdict in any proceeding about a juvenile female's right to make her own health care decisions is the simple fact that no juvenile male has ever become pregnant. For example, in order to justify restricting a juvenile female's right to abortion, the Supreme Court has clung to "the peculiar vulnerability of children" it established in *Belloti v. Baird.*[110] However, when it comes to adolescent girls' ability to make mature health care decisions, this claim is undeniably refuted by both behavioral and neuroscientific evidence.[111]

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106. *See, e.g.*, Deborah Koniak-Griffin & Carmen Turner-Pluta, *Health Risks and Psychosocial Outcomes of Early Childbearing: A Review of the Literature*, J. PERINATAL & NEONATAL NURSING, Sept. 2001, at 1, 3, 5 (discussing how juveniles who raise children at a young age often lack the resources and social support to raise children which results in increased health risks and economic problems for both); *see generally* HILLARY RODHAM CLINTON, IT TAKES A VILLAGE: AND OTHER LESSONS CHILDREN TEACH US 7 (1996) (describing the intense amount of social, emotional and economic support that children need to develop optimally).

107. *See generally* Ann S. Masten, *Resilience in Individual Development: Successful Adaptation Despite Risk and Adversity*, *in* EDUCATIONAL RESILIENCE IN INNER-CITY AMERICA: CHALLENGES AND PROSPECTS 3, 11 (Margaret C. Wang & Edmund W. Gordon et al. eds., 1994); LOUANN BRIZENDINE, THE FEMALE BRAIN 34, 35 (2006) (noting that female hormonal changes that take place during puberty serve to increase critical thinking, develop emotional responsivity, and help the female to deal with stress).

108. *See id.* at 34 (discussing how going through puberty strengthens females critical thinking and emotional responsiveness).

109. *See* Daniel Bluestein & M. Elizabeth Starling, *Helping Pregnant Teenagers*, 161 W. J. MED. 140, 142 (1994) (noting that both appropriate health care, as well as consultation between the doctor and pregnant teen, can lead to informed decisions regarding the teen's pregnancy).

110. Bellotti v. Baird, 443 US 622, 634 (1979) (Baird II). This is a "peculiar" stance given that in the United States an average of fourteen in 100,000 women die every year from pregnancy and childbirth related events, while an average of .7 women in every 100,000 die from events related to the termination of pregnancy. *See* Margaret C. Hogan et al., *Maternal Morality for 181 Countries, 1980–2008: A Systematic Analysis of Progress Towards Millennium Development Goal* 5, 375 LANCET 1609, 1617 (2010); Linda Bartlett et al., *Risk Factors for Legal Induced Abortion–Related Mortality in the United States*, 103 OBSTETRICS & GYNECOLOGY 729, 733 (2004).

111. *See supra* text accompanying notes 101–09.

V. NEUROLAW: "THE GIRL WITH THE CURL"

There was a little girl,
And she had a little curl
Right in the middle of her forehead.
When she was good,
She was very, very good,
And when she was bad she was horrid.[112]

The behavioral and neuroscientific evidence presented in the previous section convincingly demonstrate that juvenile females are capable of making autonomous decisions about their reproductive health care. However, this conclusion is not without a caveat or two. Although neuroscience may be "very good" for developing law and policy, if evidence from neuroscience is not used carefully, its use can be "horrid." Like all scientific information, neuroscientific evidence is at risk for misinterpretation and over-extrapolation.[113] It is of paramount importance that professionals, such as policy-makers, lawyers, judges, and advocates, be responsible and accurate with emerging findings from neuroscience in order to ensure their principled use.[114] Scientists have also warned that policy-makers must always be cautious when using science to direct policy, as policy in theory is meant to last a set period of time and have far-reaching power, while science has a more narrowed focus and is perpetually open to change.[115]

Scientific findings are reported in terms of probabilities, which inherently leave room for exception, and this does not sit well with the law.[116] At this point in time, well-replicated behavioral findings should command equal and at times even greater attention from the court than often-conflicting neuroscientific accounts.

Neurological data certainly has its limitations.[117] One cannot ignore individual differences, specific context, or the idiosyncratic mix of the two.[118] No two people are alike, and while data from imaging studies may show trends in structural maturity (e.g. what a teenage boy or girl's brain should look like on average)

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112. HENRY WADSWORTH LONGFELLOW, THERE WAS A LITTLE GIRL, *in* THE WORLD'S BEST POETRY 169 (Bliss Carman ed., 1904).

113. Sara B. Johnson et al., *Adolescent Maturity and the Brain: The Promise and Pitfalls of Neuroscience Research in Adolescent Health Policy*, 45 J. ADOLESCENT HEALTH 216, 216–17 (2009).

114. *See id.* at 216 (noting that "[d]espite the lack of empirical evidence," there has been heavy emphasis on adolescent brain research in shaping "health-and-welfare policy").

115. *See* Brent Garland & Mark S. Frankel, *Considering Convergence: A Policy Dialogue About Behavioral Genetics, Neuroscience, and Law*, L. & CONTEMP. PROBS., Winter/Spring 2006, at 101, 110–11 (describing that once policy changes have been implemented they can be very difficult to reform, whereas science is constantly changing).

116. *See* Maroney, *supra* note 16, at 148, 149. That said, if individuals knew there was a ninety-five percent chance of being eaten by a shark, few would go into the water believing that they would be the five percent who survive.

117. *See, e.g.*, *id* at 146 (identifying developmental neuroscience biggest limitation as its incapability of assessing people on an individual basis).

118. *See id.* (discussing how all humans differ in their rates of "structural maturation").

people develop at different speeds, depending on genetics and environmental influences.[119] If the environment demands that an individual mature quickly (for example, a juvenile with an ailing mother and younger siblings may need to work in order to support the family), the frontal lobe will likely be much more developed at age sixteen than the that of a typical high school student in an American middle class family.[120] Vanderbilt University Associate Professor of Law Terry Maroney succinctly argues:

> [S]uch 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. Researchers therefore consistently agree that developmental neuroscience cannot at present generate reliable predictions or findings about an individual's behavioral maturity. 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.[121]

Maroney points out an undeniable shortcoming, as well as the most common (at present) and blatant misuse of what neuroscience has to offer.[122] When used appropriately and accurately, the information derived from empirical studies provides vital insight into human cognition, reasoning, and behavior. Science can inform policy without being the principle factor in determining guilt or sentencing in a criminal setting. More specifically, neuroscientific data has been, and can continue to, inform decisions in both the legal and public policy realms.[123] However, in order to do so, data derived from developmental neuroscience must be used in a highly principled manner. Not doing so most assuredly creates the possibility that neuroscience may someday be considered irrelevant to legal matters.[124] For example, the overuse of poorly understood "science" led Virginia to declare all testimony about a defendant's state of mind inadmissible.[125]

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119. *Id.*

120. *See id.* at 163–64 (describing how emotional experiences, or lack thereof, are linked to the maturation process).

121. *Id.* at 146.

122. *Id.* at 145 (explaining the misuse of neuroscience by the courts).

123. *Id.* at 167.

124. *See* Johnson et al., *supra* note 113, at 219–20 (finding that neuroscience "has been used too liberally to draw conclusions where there is little empirical basis for interpreting the results" and more generally the "peril of leaving nonscientists to arbitrate and translate neuroscience for policy"); *see generally* THE LAW AND NEUROSCIENCE PROJECT, A JUDGE'S GUIDE TO NEUROSCIENCE: A CONCISE INTRODUCTION 54–71 (Andrew S. Mansfield ed., 2010) (providing an overview of existing, near future, and long run impact of neuroscience and the law).

125. Garland & Frankel, *supra* note 115, at 111 n.47 (stating that Virginia has held testimony regarding a defendant's mental state is barred unless the defendant is asserting the insanity defense).

Neuroscientists are aware that this could be the fate of brain-based evidence, if all are not prudent about how and when such evidence is used.[126] This is particularly concerning as there is great promise for increasingly accurate and comprehensive descriptions of human development. Professor Maroney reminds us that currently one of the critical contributions developmental neuroscience has to offer is a buttressing and reaffirmation of traditional juvenile justice values.[127] These values come not simply from understanding an individual's neurophysiology but from integrating what we know about the individual with a better understanding of the social and legal contexts created for juveniles more generally.[128] As long as we have legal regimes for adolescents that differ from those for adults, they should be informed by the best of what we know the differences between adolescents and adults to be; and the more information amassed, the better our understanding will be. In order to construct more rational legal regimes with regard to juveniles, insights from developmental neuroscience must be considered.

In moving forward it is judicious to proceed with awareness that the disciplines of Law and Neuroscience are still becoming fluent in each other's language.[129] Through a better mutual understanding of what developmental neuroscience can (and as importantly, cannot) offer the Court, as well as a better appreciation for how legal decisions (e.g., sentencing and access to health care) impact the development of the adolescent, a relationship can develop that will enable both Neuroscience and Law to make increasingly informed decisions that are in the best interests of both the individual and society at large.[130]

Perhaps the largest obstacle preventing a fluent conversation between Neuroscience and Law is what Garland and Frankel call "cultural differences" between Law and the sciences.[131] Simply, science is problem-focused; scientific inquiry produces data and hypotheses that are to be questioned, re-examined, and contested as part of an ongoing dialogue or process within the scientific community.[132] In taking this approach, scientific investigators acknowledge the likelihood of revision, remodeling and sometimes complete rebuking of their

126. *Id. See generally* Rosen, *supra* note 14 (highlighting the arguments of both supporters and opponents of the use of neuroscience in the courts).

127. Maroney, *supra* note 16, at 167, 175.

128. *Id.* at 175.

129. Maroney, *supra* note 16, at 175.

130. *See* Garland & Frankel, *supra* note 115, at 111–13 (proposing an excellent model for a non-governmental advisory body containing members of the legal, scientific, and criminal justice professions assist to policymakers).

131. *Id.* at 110.

132. *Id.* ("Science has a narrowing, problem-focused method, and its discoveries are seen as part of a continuing dialogue, open to change in light of new information.").

findings.[133] Science is a slow, iterative process that places convergence from many difference sources and replicability at its heart.[134]

This culture is at odds with the needs and methods of the legal system. Law works on a case-by-case basis at an extremely rapid pace (as often people's lives hang in the balance while decisions are being made), and it uses the best tools available in the moment they are needed to solve the matter at hand.[135] Often as a result of this cultural difference, scientific data–including neurological data—is misinterpreted or overextended.[136] Legislatures, courts, and advocates may take results from neuroscientific studies and bend them to "fit" their cause. Neuroscience data is not a "silver bullet" or "absolute truth" within any legal or public policy context.[137]

Ultimately, the context in which neuroscience is used (or not) is critical. For example, behavioral and neuroscientific research have amply demonstrated for decades that most people under the age of eighteen have some difficulty with impulse control, particularly under the influence of their peers.[138] It is hard to find exceptions to these findings.[139] This is not the case with juveniles' decisions that take place in reflective, structured contexts like medical decision making, and more specifically decisions concerning reproductive health.[140] Given this, it is clear that within certain settings behavioral neuroscience is an appropriate source of information for making legal decisions or setting public policies detailed previously. Developmental neuroscience provides compelling evidence that most juvenile females are mature enough to make sound autonomous decisions about their health.[141] Yet, neuroscience alone cannot set a chronological age by which adult-like reasoning is guaranteed nor determine the specific maturational status of

133. *Id.* at 110–11.

134. *Id.* at 110–11 (noting that scientific "knowledge [is] slowly built up . . . [and] values consensus and replicability").

135. *Id.* at 111 ("Lawyers and judges, on the other hand, often operate with little knowledge of science and the scientific method and work on a more pressing timeline to solve the problems immediately before them. Law moves forwards on advocacy—using the tools available at the time the conflict must be addressed.").

136. *Cf. id.* at 109–10 (providing examples of how bad science made bad law and policy in the past).

137. *See* Maroney, *supra* note 16, at 166–67 (relating the real but limited usefulness of neuroscience).

138. *See supra* notes 67–71 and accompanying text.

139. *See supra* notes 67–71 and accompanying text; *see also* Abigail A. Baird, *The Developmental Neuroscience of Criminal Behavior*, *in* THE IMPACT OF BEHAVIORAL SCIENCES ON CRIMINAL LAW 81, 110–12 (Nita A. Farahany ed., 2009) (reviewing the literature on teenage neurological development).

140. *See supra* note 93–94 and accompanying text. Health decisions about abortions are defined as "medical" in *Roe v. Wade*, 410 U.S. 113, 166 (1973) ("Up to those points, the abortion decision in all its aspects is inherently, and primarily, a medical decision . . . .").

141. *See supra* notes 90–92 and accompanying text.

a particular individual.[142] What it can do is contribute a number of critical factors for consideration when determining the legal rights of juveniles.[143]

VI. CONCLUDING REMARKS

The role of neuroscience in the courtroom is rather controversial, and understandably so. Scientific discoveries can be interpreted and implemented in very different ways, and as such science has provided one of the best and one of the worst contributions to the courts, both stemming from the same area of research: genetics. For example, the discovery and implementation of DNA profiling (also known as DNA testing or forensic DNA) has been an extremely useful addition to the court process as a valuable (and influential) piece of evidence.[144] DNA samples from both the crime scene and the suspect are taken, analyzed, and compared to determine if they are the same.[145] Before DNA profiling was widely used throughout criminal investigations, many innocent men and women were falsely found guilty,[146] and vice-versa.[147] This data can even save lives, as there have been cases of individuals on death row being proven innocent after DNA tests became a

142. *See supra* notes 109, 117–20 and accompany text.

143. *See* Maroney, *supra* note 16, at 166–67 (relating the real but limited usefulness of neuroscience for public policy).

144. *See* Margaret A. Berger, *The Impact of DNA Exonerations on the Criminal Justice System*, 34 J.L. MED. & ETHICS 320, 321 (2006) (listing reduced desirability of the death penalty, increased scrutiny of forensic lab operations, and greater consideration for all forms of forensic science as three effects of DNA profiling on the criminal justice system).

145. *See id.* at 322; *see generally About Forensic DNA*, DNA INITIATIVE, http://www.dna.gov/basics (last visited Feb. 9, 2012) (providing an in-depth review of the tools, law, and issues of DNA evidence in America).

146. As of September 2011, 273 individuals have received post-conviction DNA exonerations in the United States. *Facts on Post-Conviction DNA Exonerations*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Facts_on_PostConviction_DNA_Exonerations.php (last visited Feb. 9, 2012) [hereinafter *Facts on Post-Conviction DNA Exonerations*]. *See, e.g.*, Fernanda Santos, *DNA Testing Frees Man Imprisoned for Half His Life*, N.Y. TIMES, Sept. 21, 2006, at B1 (profiling one prisoner who was exonerated by DNA evidence).

147. Out of 273 post-conviction DNA exonerations, the true suspect was identified in 124 cases. Facts on Post-Conviction DNA Exonerations, *supra* note 146. *See, e.g.*, *What Every Law Enforcement Officer Should Know About DNA Evidence*, DNA INITIATIVE, http://www.dna.gov/audiences/investigators/know (last visited Feb. 9, 2012). The DNA Initiative provides:

> In 1996, Gerald Parker—then in a California prison on a parole violation stemming from a 1980 sentence for raping a child—was charged with the rapes and murders of five women between December 1978 and October 1979 and the murder of a fetus during a rape in 1980. DNA samples from the crime scenes were run through California's sexual assault/violent offenders database, and four of the cases were found to have been committed by the same perpetrator. After DNA tests linked Parker to the victims, he confessed to the crimes. He also confessed to a similar, fifth crime for which Kevin Lee Green had been wrongly convicted and had served sixteen years in prison.

Id.

normal part of criminal investigations.[148] The data that DNA profiling provides is invaluable, as it presents much more concrete and compelling evidence for criminal cases, and in this way science is extremely beneficial to the court.[149] The acceptance of DNA as evidence in the courtroom has taken a number of years, and undergone repeated and rigorous scrutiny,[150] making it a good use of science—"very good" indeed.[151]

Conversely, the "horrid" practice of eugenics was a scientific contribution stemming from genetic research in the 1920's and 1930's that led to the misguided decision in *Buck v. Bell*[152] to involuntarily sterilize the "feeble minded," in order to prevent future generations of criminals and "imbeciles."[153] This decision was upheld by the Supreme Court, with Justice Holmes commenting that:

> It is better for all the world, if instead of waiting to execute degenerate offspring for crime, or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind. The principle that sustains compulsory vaccination is broad enough to cover cutting the Fallopian tubes.[154]

Fortunately, in more recent times such arcane practices have been dispensed with;[155] however, history serves as an important reminder of the mindfulness with which we must proceed when incorporating science into our legal policies.

Currently, neuroscience is at the same point genetics was once at, and at present seems to be following more in the footsteps of DNA profiling rather than eugenics. If used properly and interpreted accurately, neuroscientific data could aid the courts just as much as data from DNA methodologies have. However, if professionals misuse, grossly misinterpret or "stretch" the meaning of the data, neuroscience will end up sharing its history with eugenics.[156] This is precisely the

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148. Out the 273 people exonerated through DNA, seventeen had been on death row. *Facts on Post-Conviction DNA Exonerations*, *supra* note 146. For example, Louisiana resident Ryan Matthews was falsely sentenced to the death penalty for murder in 1999, but in 2004 was given a new trial based on DNA evidence. *Ryan Matthews: Juvenile Offender in Louisiana*, THE INT'L JUSTICE PROJECT, http://www.internationaljusticeproject.org/juvRMatthews.cfm (last visited Feb. 9, 2012).

149. *See* Berger, *supra* note 144, at 322 (noting the common use of DNA testing and general consensus on its remarkable value to forensics).

150. Congress did not give all federal inmates the right for post-conviction DNA testing until 2004. Justice For All Act of 2004, Pub. L. No. 108-405, 118 Stat. 2260 (codified as amended in scattered sections of 18 U.S.C. and 42 U.S.C.) (2006). Title IV of the Justice for All Act is the Innocence Protection Act, Pub. L. No. 108-405, 118 Stat. 2278 (codified at 18 U.S.C. § 3600 (2006)). *See also* Berger *supra* note 144, at 321.

151. LONGFELLOW, *supra* note 113.

152. 274 U.S. 200 (1927).

153. Garland & Frankel, *supra* note 115, at 110.

154. *Buck*, 274 U.S. at 207.

155. *See* Paul A. Lombardo, *Taking Eugenics Seriously: Three Generations of??? Are Enough?*, 30 FLA. ST. U.L. REV. 191, 202 (2003) (stating that the history of eugenics in 19th century America finally concluded in 1979 in Virginia).

156. *See supra* note 126 and accompanying text.

danger of misusing neuroscientific references in rulings on criminal matters to try to further restrict the civil rights (especially those involving reproductive health care) of juveniles. While much scientific ground remains to be covered, neuroscience is able to meaningfully inform the court in ways that could benefit, and possibly even save, many lives.[157] It is for this, and many other reasons, that the conversation between Law and Neuroscience must continue, as the potential fruits of this labor are too important to both individuals and society to ignore.

157. *See supra* note 148 and accompanying text (describing the lives that have been saved by the evolution of DNA technology); *see also* Maroney, *supra* note 16, at 149 (discussing the positive aspects of developmental psychology and neuroscience).