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Owen D. Jones
Vanderbilt University

Richard J. Bonnie
University of Virginia - Main Campus

B. J. Casey
Cornell University

Andre Davis
U. S. Court of Appeals for the Fourth Circuit

David L. Faigman
University of California Hastings College of Law

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Authors

Owen D. Jones, Richard J. Bonnie, B. J. Casey, Andre Davis, David L. Faigman, Morris Hoffman, Read Montague, Stephen J. Morse, Marcus E. Raichle, Jennifer A. Richeson, Elizabeth Scott, Laurence Steinberg, Kim Taylor-Thompson, Anthony Wagner, and Gideon Yaffe

Law and neuroscience: recommendations submitted to the President's Bioethics Commission

Owen D. Jones[1,*], Richard J. Bonnie[2], B. J. Casey[3],
Andre Davis[4], David L. Faigman[5], Morris Hoffman[6],
Read Montague[7], Stephen J. Morse[8], Marcus E. Raichle[9],
Jennifer A. Richeson[10], Elizabeth Scott[11],
Laurence Steinberg[12], Kim Taylor-Thompson[13],
Anthony Wagner[14] and Gideon Yaffe[15]

1. Joe B. Wyatt Distinguished University Professor, New York Alumni Chancellor's Chair in Law,
and Professor of Biological Sciences, Vanderbilt University, Director, MacArthur Foundation
Research Network on Law and Neuroscience
2. Harrison Foundation Professor of Medicine and Law, Professor of Psychiatry and Neurobehavioral Sciences,
Director, Institute of Law, Psychiatry and Public Policy, Professor of Public Policy, Frank Batten School of
Leadership and Public Policy, University of Virginia
3. Sackler Professor for Developmental Psychobiology, Director, Sackler Institute, Weill Cornell Medical College
4. Judge, United States Court of Appeals for the Fourth Circuit
5. John F. Digardi Distinguished Professor of Law, Director of the UCSF/UC Hastings Consortium on Law,
Science & Health Policy, University of California, Hastings
6. District Judge, Second Judicial District, State of Colorado
7. Professor of Physics, Professor of Psychiatry and Behavioral Medicine, Director, Human Neuroimaging
Laboratory, Director, Computational Psychiatry Unit, Virginia Tech, University College, London
8. Ferdinand Wakeman Hubbell Professor of Law, Professor of Psychology and Law in Psychiatry,
University of Pennsylvania
9. Professor of Radiology and Neurology, Washington University
10. John D. and Catherine T. MacArthur Foundation Professor of Psychology, Faculty Fellow, Institute for
Policy Research, Northwestern University
11. Harold R. Medina Professor of Law, Columbia University
12. Distinguished University Professor, Laura H. Carnell Professor of Psychology, Temple University
13. Professor of Clinical Law, New York University
14. Professor of Psychology, Director of the Stanford Memory Lab, Associate Director of the Cognitive and
Neurobiological Imaging Center; Stanford University
15. Professor of Law, Professor of Philosophy & Psychology, Yale University
*Corresponding author. E-mail: owen.jones@vanderbilt.edu

It has become increasingly clear that implications for criminal justice—both negative and positive—emerge from the rapid, important, and challenging developments in cognitive neuroscience, the study of how the brain thinks.[1] Two examples will illustrate.

First, lawyers are ever more frequently bringing neuroscientific evidence into the courtroom, often in the forms of testimony about, and graphic images of, human brains.[2] This trend has produced many new challenges for judges as they attempt to provide fair rulings on the admissibility of such technical evidence, consider its proper interpretation, and assess whether the probative value of such testimony may be outweighed by its potentially prejudicial effect on juror deliberation, and hence on trial outcomes.

Second, the fast expansion of new imaging and analytic techniques has generated the hope that neuroscience, properly deployed, might help to further the goals of criminal justice. For example, given that the criminal justice system already makes predictions about future antisocial conduct for purposes of sentencing and parole, some believe that neural markers might eventually improve the accuracy of those predictions.

These two major effects—increased introduction of neuroscientific evidence and expanding optimism about the prospects for law-relevant neuroscientific insights—arise from recent technological developments that represent not just a step, but rather a leap forward in understanding both brain structure and brain function. Until recently, structure and function were studied quite separately—inasmuch as it was hard to study structure without a dead brain, and hard to study function with one. But advances in x-ray technologies opened the initial window on the structure of living brain tissue. And subsequent advances in techniques (such as functional magnetic resonance imaging), now enable non-invasive brain imaging that reveals not only a person's brain structure, but also how a person's brain is actually *functioning* as it engages in certain mental processes.

Combining these new non-invasive techniques with behavioral measures, scientists have made impressive progress toward learning such things as: the brain activity associated with perception, memory, and thought; how goals are represented at the neural level; how brain development is related to cognitive capacities; the brain activity associated with goal-directed behavior; and the relationships among brain states, decision-making processes, and mental health. Research has demonstrated the power of these techniques to aid efforts as disparate as identifying individuals who may be prone to risky decision-making, distinguishing (in some controlled contexts) between those who are lying and those who are telling the truth, understanding how brain impairments can change behaviors, and learning in greater detail the brain activity that is associated with individual differences in empathy, moral reasoning, and the ability to understand the thoughts of others.

Although the legal system is already grappling with how to engage responsibly with a flood of new neuroscience studies, it remains unclear how this relationship will develop. For example, it is unclear whether neuroscientific capabilities and neuroscientific

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[1] For overviews, see Owen D. Jones, René Marois, Martha J. Farah, Henry T. Greely, *Law and Neuroscience,* 33 J. Neuroscience 17624 (2013), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2432452; and Owen D. Jones & Francis X. Shen, *Law and Neuroscience in the United States,* in International Neurolaw: A Comparative Analysis 349 (Tade M. Spranger ed., 2012).

[2] Farahany, N. A. Memories and lies in law (Presentation). Colloquium Law Neurosci. Crim. Justice (2013).

evidence that lawyers are already bringing into the courtroom are more likely to aid or to hinder the proper administration of criminal justice. And it is unclear how the intersection of different technologies, analytic methods, and legal contexts affect the probabilities of advancing or impeding the pursuit of a maximally fair, rational, and effective criminal justice system.

Amidst this uncertainty, however, four things are clear.

- Some notable trial successes, attributable to brain-based evidence, are likely to accelerate further the already-increasing efforts by lawyers to introduce neuroscience into criminal proceedings.
- The current engagement of the criminal justice system with now arriving neuroscience is messy, unsystematized, undertheorized, underinvestigated, and—if left unattended—likely to get worse.
- Given the high stakes in criminal justice—fairness, safety, property, liberty, and life—it is vitally important that the criminal justice system develop ways to engage responsibly and usefully with the new neuroscience.
- If properly deployed and understood, modern neuroscience technologies may aid law's goals by providing useful insights on important and perennial problems that confront the criminal justice system.

From these observations two conclusions emerge. First, the criminal justice system needs guidance on approaches for distinguishing, context by context, legitimate from illegitimate uses of neuroscience. Evidentiary rulings will often be based on misinformation, misimpression, or intuition until better information, responsive to the legal system's acute needs, is developed, available, and more broadly disseminated.

Second, the criminal justice system needs interdisciplinary work and research—partnering scholars and practitioners within both law and neuroscience—to evaluate and pursue opportunities to further the fair and effective administration of criminal justice through careful incorporation of neuroscientific insights.

Taking note of rapid neuroscientific advances, President Obama recently charged his Bioethics Commission to 'identify proactively a set of core ethical standards' in the neuroscience domain.[3] And, in light of the intersection of neuroscience with criminal justice specifically, President Obama charged the Commission to consider implications 'relating to … the appropriate use of neuroscience in the criminal-justice system'.[4]

The *MacArthur Foundation Research Network on Law and Neuroscience* (the 'Research Network') is an interdisciplinary collaborative initiative supported by the John D. and Catherine T. MacArthur Foundation and is headquartered at Vanderbilt University since 2010.[5] The Research Network addresses a focused set of closely related problems at the intersection of neuroscience and criminal justice, such as: 1) investigating law-relevant mental states of, and decision-making processes in, defendants, witnesses, jurors, and judges; 2) investigating in adolescents the relationship between brain development, cognitive capacities, and decision-making; and 3) assessing how

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[3] Presidential Charge to the Commission for the Study of Bioethical Issues, July 1, 2013, http://bioethics.gov/sites/default/files/news/Charge%20from%20President%20Obama.pdf (accessed July 9, 2013).

[4] *Id.*

[5] *The MacArthur Foundation Research Network on Law and Neuroscience*, http://www.lawneuro.org/; *Network Overview*, http://www.lawneuro.org/networkoverview.pdf

best to draw inferences about individuals from group-based neuroscientific data. The aims of our Research Network are to help the legal system avoid misuse of neuroscientific evidence in criminal law contexts, and to explore ways to deploy neuroscientific insights to improve the fairness and effectiveness of the criminal justice system.[6]

Appearing below is our consensus statement, including 16 specific recommendations, submitted in answer to the Bioethics Commission's call for comments, in light of President Obama's charge.[7]

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[6]   See generally, Stephen J. Morse & Adina L. Roskies (eds.), A Primer on Criminal Law and Neuroscience: A Contribution of the Law and Neuroscience Project, Supported By the MacArthur Foundation (2013); Henry T. Greely & Anthony D. Wagner, *Reference Guide on Law and Neuroscience*, in Reference Manual on Scientific Evidence (3rd ed. 2011); Owen D. Jones et al., *Brain Imaging for Legal Thinkers: A Guide for the Perplexed*, 5 Stan. Tech. L. Rev. (2009); Owen D. Jones, Jeffrey D. Schall & Francis X. Shen, Law and Neuroscience (2014); and *The Law and Neuroscience Bibliography*, http://www.lawneuro.org/bibliography.php

[7]   Request for Comments on the Ethical Considerations of Neuroscience Research and the Application of Neuroscience Research Findings, Federal Register, January 31, 2014, https://www.federalregister.gov/articles/2014/01/31/2014-02072/request-for-comments-on-the-ethical-considerations-of-neuroscience-research-and-the-application-of

Comments of The MacArthur Foundation Research Network on Law and Neuroscience to The Presidential Commission for the Study of Bioethical Issues of the Department of Health and Human Services

Comments on the Ethical Considerations of Neuroscience Research and the Application of Neuroscience Research Findings

March 31, 2014

The President has charged the Presidential Commission for the Study of Bioethical Issues (the "Commission") to "identify proactively a set of core ethical standards" in the neuroscience domain.[1] In doing so, the Commission is to consider the potential implications of new neuroscience discoveries, as well as a series of questions that may be raised by those findings and their applications, such as those "relating to … the appropriate use of neuroscience in the criminal-justice system."[2] By notice published in the Federal Register on January 31, 2014, the Commission has invited comment on these issues.[3] The MacArthur Foundation Research Network on Law and Neuroscience (the "Research Network") responds here, specifically, to issues at the intersection of law and criminal justice.

The Research Network is an interdisciplinary collaborative initiative supported by the John D. and Catherine T. MacArthur Foundation and headquartered at Vanderbilt University since 2010. The Research Network addresses a focused set of closely-related problems at the intersection of neuroscience and criminal justice, such as: 1) investigating law-relevant mental states of, and decision-making processes in, defendants, witnesses, jurors, and judges; 2) investigating in adolescents the relationship between

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[1] Presidential Charge to the Commission for the Study of Bioethical Issues, July 1, 2013, at http://bioethics.gov/sites/default/files/news/Charge%20from%20President%20Obama.pdf

[2] *Id.*

[3] Request for Comments on the Ethical Considerations of Neuroscience Research and the Application of Neuroscience Research Findings, Federal Register, January 31, 2014, https://www.federalregister.gov/articles/2014/01/31/2014-02072/request-for-comments-on-the-ethical-considerations-of-neuroscience-research-and-the-application-of

brain development, cognitive capacities and decision-making; and 3) assessing how best to draw inferences about individuals from group-based neuroscientific data.[4]

Composed of a team of 15 scholars from universities across the country working in fields such as legal studies, neuroscience, psychology, and philosophy, the Research Network's missions are to help the legal system avoid misuse of neuroscientific evidence in criminal law contexts and to explore ways to deploy neuroscientific insights to improve the fairness and effectiveness of the criminal justice system.

The Research Network sees three main domains for the Commission to consider at the intersection of neuroscience and criminal law: 1) what steps should be taken to enhance the capacity of the criminal justice system to make sound decisions regarding the admissibility and weight of neuroscientific evidence?; 2) to what extent can the capacity of neurotechnologies to aid in the administration of criminal justice be enhanced through research?; and 3) in what additional ways might important ethical issues at the intersection of neuroscience and criminal justice be addressed? In the course of discussing these three domains below, we submit sixteen (16) recommendations for the Commission's consideration.

1. **Question: What steps should be taken to enhance the capacity of the criminal justice system to make sound decisions regarding the admissibility and weight of neuroscientific evidence?**

   a. Rationale:
      i. Litigants have already proffered neuroscientific evidence in state and federal courts and are doing so with increasing frequency. In reaction, federal and state judges have sought training in this area, including through our Research Network (although more have sought training than we have been able to accommodate[5]). Lawyers and law professors are also seeking training with increasing frequency. Without expert guidance, judges, jurors, and lawyers are ill-equipped to understand the technologies involved. They are also ill-equipped to distinguish between legitimate and illegitimate inferences. On one hand, neuroscientific evidence can be seen as a mere subset of scientific evidence, posing the same basic challenges. On the other hand, neuroscientific evidence raises some special concerns, both because it is more technical than many other kinds of scientific evidence courts may encounter, and because there is reason to believe that decision-makers may sometimes afford neuroscientific evidence (such as brain images) more weight than is properly due.

   b. Recommendations:
      i. **Recommendation 1:** The Commission should recommend federal funding for training programs to aid judges (as well as parole officers, others

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4. The MacArthur Foundation Research Network on Law and Neuroscience: http://www.lawneuro.org/
5. In each of the past two years, for example, the Research Network's *Education and Outreach* program has sponsored a *Colloquium for Federal Judges on Law, Neuroscience, and Criminal Justice*. Across these two years, 135 federal judges applied for 35 available slots.

in the criminal justice system, and legal educators) in understanding the neurotechnologies (as well as related issues in science, hypothesis testing, and statistics) in order to improve the likelihoods of suitable decisions regarding proffers of neuroscientific evidence.

ii. **Recommendation 2:** The Commission should call for development—perhaps under the auspices of a standing committee of the National Academy of Sciences—of "best practices" and advisable review mechanisms with respect both to the presentation of neuroscientific evidence in court and to its interpretation.

iii. **Recommendation 3:** The Commission should recommend increased cooperation and coordination between NIH, NSF, and DOJ regarding issues at the intersection of law and neuroscience, and the funding necessary to address those issues.

2. **Question: To what extent can the capacity of neurotechnologies to aid in the administration of criminal justice be enhanced through research?**

Here, we identify several distinct topics that we believe are important for the Commission to consider.

Adolescents: To what extent might neuroscientific research inform fundamental policy questions bearing on justice system responses to adolescent offenders, including fairness, effectiveness of interventions in preventing offending, and developmentally appropriate responses to adolescent wrongdoing?

a. Rationale:
i. Adolescence is the distinct but transient period of development between childhood and adulthood that is characterized by increased experimentation and risk-taking, a tendency to discount long-term consequences, and heightened sensitivity to peers and other social influences.[6] Neuroscientific evidence of significant changes in brain structure and function during adolescence strongly suggests that these cognitive tendencies of adolescents are associated with biological immaturity of the brain, and of the interactions of its constituent subsystems. Neuroscience may therefore help efforts to administer a fair juvenile justice system by aiding deliberations about relative culpability, treatment, rehabilitation, and sentencing. Nevertheless, neuroscience cannot by itself offer complete explanations of adolescent and young adult behavior. Further research to link brain functioning and brain development to behavioral outcomes relevant to law could help to identify salutary reforms for the treatment of adolescent offenders in the juvenile justice system.

b. Recommendations:
i. **Recommendation 4:** The Commission should recommend that NIH encourage research, including longitudinal research, that robustly

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6   See generally, National Research Council, *Reforming Juvenile Justice: A Developmental Approach* (Washington, DC: The National Academies Press (2013)), available: http://www.nap.edu/catalog.php?record˙id=14685.

combines neuroscientific methods for studying brain structure and function with behavioral methods to advance understanding of adolescent decision-making and judgment in social and emotional situations as well as the developmental maturity of adolescents and young adults.

ii. **Recommendation 5**: The Commission should recommend that NIH (in coordination with DOJ) devote a portion of the funding that is directed to the study of normative and atypical brain development in adolescence to specifically examining the links between adolescent brain development and legally-relevant behaviors and capacities.

Lies & Memories: To what extent, if any, can neuroscientific techniques: improve the detection of lies; enable the identification of memories for people, locations, and events; and help to evaluate memory accuracy?

a. Rationale:

i. Distinguishing between truthful statements and lies is a core task of the criminal justice system. There are few ways to do this reliably. The jury is not very effective at it. Neither is the traditional polygraph. At least one company offers brain-scanning for lie detection purposes. And such evidence has already been offered in both state and federal courts. A deeper understanding of the abilities and limits of the technologies is needed, as is a better clarification of what, precisely, would need to be demonstrated for such technologies to be (in suitable cases) admissible. At the same time, existing work strongly suggests that coupling machine-learning algorithms with brain-scanning devices can distinguish between cases when a person remembers having seen a presented image before and when she has no memory of the image. Development of this capability, as well as methods to evaluate the accuracy of reported memories, could have valuable, as well as disturbing, implications for the criminal justice system.

b. Recommendations:

i. **Recommendation 6**: The Commission should recommend that NSF (particularly the Programs in Law & Social Sciences; Cognitive Neuroscience; and Decision, Risk, and Management Sciences) and DOJ (for instance through NIJ) fund studies that directly investigate the promise and the limitations of neurotechnologies for lie detection purposes.

ii. **Recommendation 7**: The Commission should recommend that NSF (the same programs mentioned above) and DOJ (for instance through NIJ) fund studies that directly investigate the promise and the limitations of using neurotechnologies for memory detection and evaluation purposes.

Biases: To what extent might neuroscientific techniques help to advance our abilities to identify, understand, and potentially counteract, biases that can unfairly skew decision-making in the criminal justice system?

a. Rationale:

   i. Research demonstrates that human decision-making often reflects illogical and unwarranted biases, both conscious and unconscious. Many of these—such as racial, ethnic, and gender biases—are particularly problematic and should not be ignored. Others—including hindsight, anchoring, and framing biases, and the like—can also lead astray. In the criminal justice domain, such decision-making biases can cause serious miscarriages of justice. Neuroscience, in conjunction with social and cognitive psychology, may offer new insights and new methods for identifying and counteracting biases, especially those that are out of conscious awareness.

b. Recommendation:

   i. **Recommendation 8**: The Commission should recommend, in furtherance of efforts to de-bias decision-making, that the NSF and NIJ undertake to study the use of neurotechnologies (such as brain imaging) in the development of techniques to detect and to better understand biases that adversely affect the criminal justice system.

   Predictions: To what extent can neuroscience aid the criminal justice system's ability to make suitable and useful judgments regarding recidivism and future violence, and regarding the effectiveness of therapeutic interventions?

a. Rationale:

   i. One of the most enduring challenges of the criminal justice system under common sentencing systems is assessing the likelihood of recidivism or future violence. Actuarial, data-driven approaches have proved to be more accurate than unstructured clinical assessments. Neuroscientific studies might usefully add to existing data-driven approaches. One recent study[7] suggests that there may be some promise in this approach. But that study is not without its critics,[8] and it would be wise to investigate further both the potential promise and the limitations of neuroprediction. Neuroscientific technologies might also aid the criminal justice system's ability to understand and successfully treat offenders who have disorders with substantial neurological underpinnings, such as addiction, traumatic brain injuries, or post-traumatic stress disorders.

b. Recommendations:

   i. **Recommendation 9**: The Commission should recommend that NSF (the same programs mentioned above) and DOJ (for instance through NIJ) fund studies that directly investigate the promise and the limitations of using neurotechnologies to add value to existing data-driven approaches to predicting recidivism and future violence.

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7   Eyal Aharoni, et al., *Neuroprediction of Future Rearrest,* 110(15) PNAS 6223 (2013).

8   Russ Poldrack, *How Well Can We Predict Future Criminal Acts from fMRI Data?*, russpoldrack.org (April 6, 2013), available: http://www.russpoldrack.org/2013/04/how-well-can-we-predict-future-criminal.html

ii. **Recommendation 10:** The Commission should recommend that NIH and NSF fund studies that directly investigate the promise and the limitations of using neurotechnologies in assessment and treatment of offenders with addiction, traumatic injuries, or other disorders.

iii. **Recommendation 11:** Because of the unique challenges of predicting future behavior of offending adolescents, the Commission should recommend that NSF (the same programs mentioned above) and DOJ (for instance through NIJ) fund studies that explore the extent to which neuroscientific information may add value in the prediction of future criminality and violence among juveniles convicted of serious crimes.

Future Research: To what extent can the federal government help to propel exploration of both the promise and the limitations of using neuroscientific technologies in criminal justice contexts?

a. Rationale:
   i. At the same time that it is appropriate to learn the limitations of the neurotechnologies, and the limits on inferences to be drawn, it remains important to balance a suitable skepticism with appropriate open-mindedness about the ways in which these new techniques might further the goals of the criminal justice system. More research—both experimental and conceptual—is needed.

b. Recommendations:
   i. **Recommendation 12:** The Commission should recommend that the NSF (particularly the Programs in Law & Social Sciences; Cognitive Neuroscience; and Decision, Risk, and Management Sciences) and DOJ devote an increased percentage of resources to funding collaborative, interdisciplinary work at the intersection of law and neuroscience.
   ii. **Recommendation 13:** Because NSF has a dedicated "Law and Social Sciences" program, but lacks a corresponding "Law and Life Sciences" program, the Commission should recommend that NSF either create a program on "Law & Life Sciences" or, in the alternative, rename the "Law & Social Sciences" program as the "Law & Science" program (with a commensurate broadening of mission and scope).

3. **Question: In what additional ways might important ethical issues at the intersection of neuroscience and criminal justice be addressed?**

a. Rationale:
   i. New neuroscientific technologies and findings have raised, and will increasingly raise, important legal and ethical implications. These include issues relating to fundamental fairness and respect for persons, such as concerns about misrepresentations and unjustified inferences that can be drawn from neuroscientific evidence, the uses of neuroscience for lie detection or memory detection, and the role of neuroscience in potentially detecting and counteracting stereotyping. These also include, as President Obama noted in his charge to the Commission, concerns

about potential "stigmatization and discrimination based on neurological measures."[9] There is therefore a continuing need for discussion and analysis of these issues. The most sensible and effective approach is to conduct such discussion and analysis in parallel with the development of the technologies that give rise to them.

b. Recommendations:
    i. **Recommendation 14:** The Commission's Report should caution against over-interpreting neuroscientific data, given the important legal and ethical issues often implicated.
    ii. **Recommendation 15:** The Commission's Report should: caution against misuses of neuroscientific data to enhance racial, ethnic, gender, or other stereotypes; encourage awareness of the history and risks of such misuses; and encourage researchers to take active steps to prevent misinterpretations and misuses.
    iii. **Recommendation 16:** The Commission should recommend that the President's BRAIN Initiative include an explicit and substantial Ethical, Legal, and Social Implications (ELSI) component, reflected in a dedicated percentage of the overall budget.

CONCLUSION

The Research Network commends the Commission for recognizing the ethical implications of neuroscience research and the application of neuroscience research findings, especially in the criminal justice system. The Research Network strongly recommends that the Commission consider important questions in the domains of: 1) enhancing the capacity of the criminal justice system to make sound decisions regarding the admissibility and weight of neuroscientific evidence; 2) exploring the extent to which the capacity of neurotechnologies to aid in the administration of criminal justice may be enhanced through research; and 3) considering additional avenues for addressing important ethical issues at the intersection of neuroscience and criminal justice.

Upon invitation from the Commission, the Research Network would be happy to supply additional commentary, insights, or feedback on these matters.

Respectfully submitted,

The MacArthur Foundation Research Network on Law and Neuroscience
www.lawneuro.org

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9   Presidential Charge to the Commission for the Study of Bioethical Issues, July 1, 2013: http://bioethics.gov/sites/default/files/news/Charge%20from%20President%20Obama.pdf

Owen D. Jones	Vanderbilt University	New York Alumni Chancellor's Chair in Law; Professor of Biological Sciences;
		Director, MacArthur Foundation Research Network on Law and Neuroscience
Richard J. Bonnie	University of Virginia	Harrison Foundation Professor of Medicine and Law; Professor of Psychiatry and Neurobehavioral Sciences; Director, Institute of Law, Psychiatry and Public Policy; Professor of Public Policy, Frank Batten School of Leadership and Public Policy
BJ Casey	Cornell University	Sackler Professor for Developmental Psychobiology
Andre Davis	United States Court of Appeals for the Fourth Circuit	Judge
David L. Faigman	University of California, Hastings	John F. Digardi Distinguished Professor of Law, Director of the UCSF/UC Hastings Consortium on Law, Science & Health Policy
Morris Hoffman	Second Judicial District, State of Colorado	District Judge
Read Montague	Virginia Tech; University College, London	Professor of Physics; Professor of Psychiatry and Behavioral Medicine; Director, Human Neuroimaging Laboratory; Director, Computational Psychiatry Unit
Stephen J. Morse	University of Pennsylvania	Ferdinand Wakeman Hubbell Professor of Law; Professor of Psychology and Law in Psychiatry
Marcus E. Raichle	Washington University	Professor of Radiology and Neurology

Jennifer A. Richeson	Northwestern University	John D. & Catherine T. MacArthur Foundation Professor of Psychology; Faculty Fellow, Institute for Policy Research
Elizabeth Scott	Columbia University	Harold R. Medina Professor of Law
Laurence Steinberg	Temple University	Distinguished University Professor; Laura H. Carnell Professor of Psychology
Kim Taylor-Thompson	New York University	Professor of Clinical Law
Anthony Wagner	Stanford University	Professor of Psychology; Director of the Stanford Memory Lab; Associate Director of the Cognitive and Neurobiological Imaging Center
Gideon Yaffe	Yale University	Professor of Law; Professor of Philosophy & Psychology