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Imagining a New Era of Neuroimaging, Neuroethics, and Neurolaw

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Foreword: Imagining a New Era of Neuroimaging, Neuroethics, and Neurolaw

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The human brain has been at the center of medicolegal debates since the late 1960s, when efforts began to develop an alternative definition of death: one centered on brain function instead of heart and lung function. Technological developments and new surgical techniques made this new definition of death, sometimes called "brain death," seem necessary. Mechanical ventilation, a technology that allows respiration and therefore heartbeat to continue after the brain ceases functioning, and heart transplantation, which requires a corpse with a beating heart as a donor, necessitated the definitional alternative. Irreversible cessation of all functions of the brain has been accepted both medically and legally as confirming the death of an individual. The medicolegal discussions have since concentrated on examination of the brain in living humans.

This year's Symposium issue of the *American Journal of Law & Medicine*, "Brain Imaging and the Law," is devoted to the legal implications of rapidly-developing imaging technology that goes beyond structural imaging of the brain to display a representation of brain functioning. As with contemporary medicolegal and bioethical literature on the implications of genetic engineering and nanotechnology, there is much imagination, hype, and even science fiction in this new arena, dubbed "neurolaw."[1] There is also, nonetheless, significant technological wizardry. Although functional neuroimaging is not ready for routine courtroom use, the Journal's editors who selected this topic, and recruited the authors of the articles in this issue, chose wisely. Serious reflection, and even imaginative speculation, on what new brain imaging technologies can and cannot tell us, and of what legal use they may be in the future, are essential to adequately prepare for a future

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[1] Jeffrey Rosen, *The Brain on the Stand*, N.Y. TIMES MAGAZINE, March 11, 2007, at 49.

filled with more and more colorful and compelling images of the human brain.

Ronald Cranford, M.D., to whom this issue is dedicated, was perhaps the nation's leading mediator between neuroscience and the law. Shortly before his death on May 31, 2006, Ron, a neurologist by specialty, agreed to write for this Symposium Issue. His planned article would have, among other things, traced the legal developments in brain imaging and other diagnostic techniques utilized by experts testifying in major "right to die" cases from 1977 to 2006. His plan was to concentrate on ten of those cases that he helped frame, which in turn defined his own medicolegal career. I met Ron at an American Society of Law and Medicine meeting in Detroit in 1979, and worked with him on a variety of issues over the following decades. This work included defining the role of ethics committees and ethics consultation in formulating hospital policies on brain-death determinations, Do Not Resuscitate orders, living wills, and health care proxies; and more specifically on persistent and permanent vegetative states, and how medical determinations should inform ethical and legal decision-making.[2] We did not always agree, but I always found his insights and arguments coherent, constructive, and patient and family-focused. The American Society of Law, Medicine & Ethics was very fortunate to have Ron serve as both its president and longtime board member. He personified how physicians and lawyers should work together to support families caught up in the medicolegal controversies of our day, as well as how our professions can work together to advance public policy in ways that neither profession can do alone.

In the context of this symposium issue, we are all fortunate that Ron summarized his major conclusions from his life in the clinic and in the courtroom in a speech at a Boston University conference on the Terri Schiavo case on March 31, 2006, just two months before his death.[3] His presentation was videotaped and is easily accessible.[4] What made Ron exceptional was not just his medical knowledge and experience—although he was unsurpassed in the areas of persistent and permanent vegetative states. It was his view of his own role in the major "right to die" cases that played out in the nation's courtrooms. As he described it, his "main role was to present the judges with the medical evidence" in an understandable way.[5] But Ron was more than simply an articulate and understandable expert medical witness. He insisted on acting as an "adviser to families," to provide them with support, and as an "educator," to help inform the public of the issues involved, especially about the nature of the permanent vegetative state and how it differs from the minimally conscious state.[6] He was especially proud of his work with the

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[2] *See, e.g.*, RONALD E. CRANFORD INSTITUTIONAL ETHICS COMMITTEES AND HEALTH CARE DECISION MAKING (Edward A. Doudera, ed., 1984); Ronald Cranford et al., *Uniform Brain Death Act*, 29 NEUROLOGY 417 (1979); Ronald E. Cranford, *The Spring Case and the Importance of Interdisciplinary Dialogue*, MEDICOLEGAL NEWS, Feb. 1981, at 17.

[3] Conference on the Terri Schiavo Case: One Year Later, held by the Boston University School of Law (Mar. 31, 2006), *available at* http://www.bu.edu/law/events/audio-video/shiavo.html.

[4] *Id.* (providing links to the entire conference, including Ron Cranford's speech).

[5] *Id.*

[6] *Id. See also* Ronald Cranford, *The Persistent Vegetative State: The Medical Reality (Getting the Facts Straight)*, HASTINGS CENTER REPORT, March 1988, at 27-32.

judges and families in the *Brophy*,[7] *Cruzan*,[8] *Busalacchi*,[9] *Rosebush*,[10] *Martin*,[11] and *Wendland*[12] cases.[13] But it was in his triple role as medical expert, family supporter, and public educator in the *Schiavo*[14] case for which he became best known, and ultimately created what is likely to be his most lasting legacy. His role in that case also provides a context for use of neuroimaging in the courtroom.

The details of the *Schiavo* case have been explored in depth elsewhere.[15] For our purposes, what was remarkable was not the heated family dispute about Terri Schiavo's wishes regarding continuance of her feeding tube, but the use of two images in informing (or misinforming) the public and Congress about her condition. The first image, captured both on videotape and in still photography, is of Terri Schiavo smiling and seemingly recognizing her mother. After viewing the videotape, U.S. Senate majority leader and physician Bill Frist concluded that, "that footage, to me, depicts something very different than persistent vegetative state."[16] Similarly, Congressman Phil Gingrey, an obstetrician, before voting on a bill to give the federal courts jurisdiction over Terri's case, said, "she responds to people around her; she smiles and she can feel. Terri's condition can improve."[17] Other physician-Congressmen, like Dave Weldon, agreed: "by my definition she was not in a vegetative state based on my review of the videos."[18]

As Ron observed, when the videotapes were released to an uninformed media and public (and he could have added, an uninformed Congress and President), people who "had no way of recognizing the typical features of someone in a vegetative state" were misled "into believing that Terri could meaningfully and cognitively interact with her parents and thus was not in a vegetative state."[19] This misperception led to demonstrations and allegations of physician attempts to "starve" Terri to death. In stark contrast, informed viewing of the videotapes led to the opposite conclusion. As Ron observed, the videotapes of Terri's neurological examinations, which he recommended be

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7 Brophy v. New England Sinai Hosp., 497 N.E.2d 626 (Mass. 1986).

8 Cruzan v. Dir., Mo. Dep't of Health, 497 U.S. 261 (1990).

9 *In re* Busalacchi, 1991 Mo. App. 315 (1991).

10 *In re* Rosebush, 491 N.W.2d 633 (Mich. Ct. App. 1992).

11 *In re* Martin, 538 N.W.2d 399 (Mich 1995).

12 Conservatorship of Wendland, 28 P.3d 151 (Cal. 2001).

13 Conference on the Terri Schiavo Case: One Year Later, *supra* note 3. *See, e.g.*, Andrew J. Broder & Ronald E. Cranford, 'Mary, Mary, Quite Contrary, How Was I to Know?' *Michael Martin, Absolute Prescience, and the Right to Die in Michigan*, 72 U. DET. MERCY L. REV. 787 (1994); Lawrence J. Nelson & Ronald E. Cranford, Michael *Martin and Robert Wendland: Beyond the Vegetative State*, 15 J. CONTEMP. HEALTH L. & POL'Y 427 (1999).

14 *In re* Schiavo, 851 So. 2d 182 (Fla. Dist. Ct. App. 2003).

15 *E.g.*, George J. Annas, *'I Want to Live': Medicine Betrayed by Ideology in the Political Debate over Terri Schiavo*, 35 STETSON L. REV. 49 (2005); THE CASE OF TERRI SCHIAVO: ETHICS AT THE END OF LIFE (Arthur L. Caplan, James J. McCartney & Dominic A. Sisti, eds., 2006); MICHAEL SCHIAVO & MICHAEL HIRSH, TERRI: THE TRUTH (2006); MARY SCHINDLER & ROBERT SCHINDLER, A LIFE THAT MATTERS: THE LEGACY OF TERRI SCHIAVO—A LESSON FOR US ALL (2006).

16 Senator Majority Leader Bill Frist, Floor Statement on Terri Schiavo Bill (Mar. 17, 2005) *available at* http://www.nationalreview.com/comment/frist200503181027.asp.

17 151 Cong.Rec.H712-H713 (statement of Sen. Phil Gingrey).

18 151 Cong.Rec.H7115 (statement of Sen. Dave Weldon).

19 Conference on the Terri Schiavo Case: One Year Later, *supra* note 3.

done, convinced the trial judge, Judge George Greer,[20] as well as the appellate court, that the medical evidence supporting the conclusion that Terri was in a permanent vegetative state was "irrefutable."[21]

A second image, which Terri's husband, Michael, resisted releasing to the public until her case was taken up by Congress, was of the CT scan of her brain. Ron described the displayed CT scan to Dan Abrams and his MSNBC viewers on March 29, 2005:

> CRANFORD: . . . [T]his is a CT scan of Terri Schiavo taken in 2002, the most recent CT scan done on her, 2002.
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> ABRAMS: Tell us what it means.
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> CRANFORD: Well it shows extremely severe atrophy. Where those black areas are, that should be white. That should be cerebral cortex, and so really there is no cerebral cortex left. It's just a shrinkage of the cerebral cortex. It's a thin band of white on the outside and any neurologist or any radiologist looking at those CT scans will tell you that her atrophy could not be more severe than it is. So even if she were mentally conscious, which she's not, she's irreversible. She's been like this for 15 years, Dan, and that CT scan shows the most extreme severe atrophy of the higher centers of the brain.
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> ABRAMS: And what about those who say that there should have been more tests? That she's never had a PET scan. That she needs another MRI.
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> CRANFORD: Well she doesn't need an MRI because a[n] MRI will not show any more damage than this CT and you can again check with any radiologists. They'll tell you this CT scan is more than adequate.
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> ABRAMS: . . . You're in the center of it. How has that been for you?
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> CRANFORD: . . . I know there's sympathy for the family. When you see those pictures, it looks like Terri is interacting, but do you know what? She is really not. That's what the vegetative state is. It looks like they're interacting, but they're really not. And there's nothing I can do to change that.[22]

Ultimately, the autopsy was consistent with Ron's clinical diagnosis, confirming not only the extensive brain atrophy, but also the absence of the optic nerve[23]—although Terri appeared to be able to see in the photographs and videotape, in fact she was totally blind. Among other things, the *Schiavo* case demonstrated that looks can be deceiving, and that in cases of family conflict there will be a quest for any diagnostic test that seems to provide a

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[20] Judge Greer also spoke at the Schiavo conference.

[21] Ronald Cranford, *Facts, Lies, and Videotapes: The Permanent Vegetative State and the Sad Case of Terri Schiavo*, 33 J.L. MED. & ETHICS 363 (2005).

[22] *The Abrams Report—Terri Schiavo's 2002 CT Scan* (MSNBC television broadcast Mar. 29, 2005) *available at* http://www.msnbc.msn.com/id/7328639/.

[23] JON R. THROGMARTIN, REPORT OF AUTOPSY (2005) *available at* http://news.findlaw.com/hdoc/docs/Schiavo/61305autopsyrpt.pdf.

definitive medical answer. As Joe Fins described the scene, shortly after the Congressional debate on special legislation for Terri Schiavo, his neuroimaging group at Cornell was

> deluged with requests for scans and images [of Terri's brain] from media on both sides of the issue . . . . All wanted to believe that there was a technological solution to the diagnostic quandary created by politics, religion and the rejection of objective clinical determinations. In this context a picture could be worth a thousand briefs, even if the picture would be equivocal.[24]

It is, of course, the immediacy and seeming infallibility of pictures that make them simultaneously valuable and dangerous. Their potential to provide vivid and compelling, but simultaneously misleading, information is at the heart of many of the articles on neuroimaging in this issue.[25] There is a rich history of utilizing "junk science" to try to correlate brain structure with brain function, most compellingly illustrated by the rise and fall of phrenology.[26] We also have a history of the state adopting new technology to control its citizens, and not only in times of war or terror. Bruce Arrigo, for example, concentrates on this danger, which he sees as inherent in brain-imaging technology. In his article, he provocatively and productively uses the work of Foucault, Baudrillard, and Fromm as lenses to explore the criminal law implications of functional brain imaging technology that necessarily subjects all of us to "invasive disciplining through [this] panoptic power."[27] As he sees it, "The question . . . is whether the new technologies . . . further relegate the individual to the status of a mere *body of utility* consistent with the culture of control and the political and economic interests of the state."[28] All new technologies confront us with this question; but technologies that seek to explain what is happening in our heads are perhaps the most threatening to our liberty.

Thus, it is no surprise that in the midst of what has been styled a "global war on terror," as Jonathan Marks and Sean Thompson both explore in different contexts, counterterrorism military officers and police will want to employ neuroimaging technologies in interrogations, whether or not civilian courts ever accept them as probative "lie detectors."[29] Nor is acceptance by

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[24] Joseph J. Fins, *The Orwellian Threat to Emerging Neurodiagnostic Technologies*, 5 AM. J. BIOETHICS 56 (2005). On continuing attempts to use functional neuroimaging to confirm a vegetative state diagnosis see Adrian Owen et al., *Detecting Awareness in the Vegetative State*, 313 SCIENCE 1402 (2006).

[25] *E.g.*, Laura Khoshbin & Shahram Khosbin, *Imaging the Mind, Minding the Image—An Historical Introduction to Brain Imaging and the Law*, 33 AM. J.L. & MED. 171 (2007) and Joseph Baskin, Judith Edersheim & Bruce Price, A Picture *is Worth a Thousand Words: The Role of Neuroimaging in the Courts*, 33 AM. J.L. & MED. 239 (2007).

[26] *E.g.*, Stacey Tovino, *Imaging Body Structure and Mapping Brain Function: A Historical Approach*, 33 AM. J.L. & MED. 193 (2007).

[27] Bruce Arrigo, *Punishment, Freedom, and the Culture of Control: The Case of Brain Imaging and the Law*, 33 AM. J.L. & MED. 457, 492 (2007).

[28] *Id.* at 447 (emphasis in original).

[29] Jonathan H. Marks, *Interrogational Neuroimaging in Countertorrorism: A 'No-Brainer' or a Human Rights Hazard?*, 33 AM. J.L. & MED. 483, 483-500 (2007); Sean Kevin Thompson, *A Brave New World of Interrogation Jurisprudence?*, 33 AM. J.L. & MED. 341, 341-358 (2007). On the use of brain technology in the military, see JONATHAN D. MORENO, MIND WARS: BRAIN RESEARCH AND NATIONAL DEFENSE (2006).

courts likely anytime soon. As Hank Greely and Judy Illes show, the scientific basis for using any of these imaging methods for lie detection has yet to be demonstrated, and their call for a regulatory regime to at least demand a demonstration of safety and efficacy is persuasively stated.[30] More and better research will need to be done. But Jennifer Kulynych is also entirely persuasive in cataloging a litany of unsolved conundrums in neuroimaging research itself, many of which demand solution before large-scale research is ready to be conducted.[31]

It is worth returning to Foucault, because he is also instructive on the core theme of this entire issue: the power of the neuroimages themselves to shape our perception of reality. In his essay on the mammoth and monumental painting by Velazquez, *Las Meninas*, Foucault underscored the inherent differences between language and pictures, noting that as much as we try to verbally explain an image, "language [is] invariably inadequate to the visible fact . . ."[32] He continued,

> the relation of language to painting is an infinite relation. It is not that words are imperfect, or that confronted by the visible, they prove insuperably inadequate. Neither can be reduced to the other's terms: it is in vain that we say what we see; what we see never resides in what we say.[33]

Put another way, expert testimony introducing and explaining an image, as well as the judge's instructions explaining the image's significance in the case, can easily be overwhelmed by the power of the image itself to convey its own message. This is perhaps the primary reason why the question of what rules courts should apply to determining whether to permit the use of brain imaging in the courtroom, for both civil and criminal cases, is central to a number of the essays in this collection, most notably the contribution of Mark Pettit.[34]

This is the essence of the problem the law confronts when it is itself confronted with pictures of the brain. It is not enough to try to explain what these images show—as many of the articles in this collection argue from a variety of perspectives, the images carry their own power detached from expert analysis or judicial instruction. It is one thing for judges to look at a CT scan, as the appellate judges in the *Schiavo* case did, writing, "We have examined the brain scans with the eyes of educated laypersons and considered

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[30] Henry T. Greely & Judy Illes, *Neuroscience-based Lie Detection: The Urgent Need for Regulation*, 33 AM. J.L. & MED. 377, 377-420 (2007). *See also*, Sarah Stoller & Paul Root Wolpe, *Emergening Neurotechnolgies for Lie Detection and the Fifth Amendment*, 33 AM. J.L. & MED. 359, 359-375 (2007).

[31] Jennifer Kulynych, *The Regulation of MRI Neuroimaging Research: Disentangling the Gordian Knot*, 33 AM. J.L. & MED. 295, 295-317 (2007).

[32] MICHEL FOUCAULT, THE ORDER OF THINGS 9 (1971).

[33] *Id.*

[34] Mark Pettit, *fMRI and BF Meet FRE: Brain Imaging and the Federal Rules of Evidence*, 33 AM. J.L. & MED. 319, 319-340 (2007). Of course, as Adam Kolber so well demonstrates, it is not just in the courtroom that images may tell us more (or less) than they seem, but in the determination of inherently subjective reality, like pain, as well. Adam Kolber, *Pain Detection and the Privacy of Subjective Experience*, 33 AM. J.L. & MED. 433, 456 (2007).

the explanations provided by the doctors in transcripts."[35] It is quite another, however, to turn colorful functional magnetic resonance images over to a jury with conflicting expert testimony about their meaning and a judicial instruction about what can be done with them.[36]

Of course, as Stephen Morse has insisted, neuroscience cannot answer legal or ethical questions. For example, it cannot tell us if an individual should be held legally responsible for his criminal acts. In Morse's words, that question "is moral and ultimately legal" and will have to be answered not in the laboratory, but in the courtroom and in the legislature.[37] Laurence Tancredi and Jonathan Brodie make the point from a different angle, noting correctly that producing an image simultaneously produces a question concerning the causal relationship (and whether there even is one) between the image and the behavior in question:

> [W]hat is actually being discovered by an MRI or fMRI[?] . . . . An abnormal image does not tell us what is happening causally between the abnormality and the brain region, or the abnormality and the behavior in question. Hence the image is not in a one-to-one relationship with the brain. To illustrate, a brain image does not show us what criminal intent, or a "bad" thought, looks like. It does not provide a causal connection . . . .[38]

And, as Steven Pinker succinctly argued in his profound and accessible book, *The Blank Slate*, even if the causal connection between the image and behavior was one-to-one, the legal conclusion does not follow, because "to explain behavior is not to exonerate the behavior."[39] Among other things, Pinker reminds us,

> The explanations may help us understand the parts of the brain that made a behavior tempting, but they say nothing about the *other* parts of the brain (primarily in the prefrontal cortex) that could have inhibited the behavior by anticipating how the community would respond to it.[40]

It is commonplace in both clinical medicine and the courtroom that things may not always be as they appear, and may even be the opposite. This is true of the Velazquez painting, *Las Meninas*, in which the five-year-old Dona Margarita is portrayed as smiling. Is she smiling in contentment at the painter, or mischievously at her parents, or playfully at the dwarf Maribarbola; or, is it impossible to read her mind from her face?

Smiles are no easier to interpret in real life, perhaps especially in the clinic and the courtroom. Ron Cranford provides us with another fitting image to conclude this introduction. Ron described how, in examining the

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[35] In re Guardianship of Schiavo, 800 So. 2d 640 (Fla. Dist. Ct. App 2003). *See also* Cranford, *supra* note 21, at 363.

[36] *See, e.g.*, *supra* notes 23-24 and accompanying text.

[37] Rosen, *supra* note 1, at 84.

[38] Laurence Tancredi & Jonathan Brodie, *The Brain and Behavior: Limitations in the Legal Use of Functional Magnetic Resonance Imaging*, 33 AM. J.L. & MED. 271, 288 (2007).

[39] STEVEN PINKER, THE BLANK SLATE: THE MODERN DENIAL OF HUMAN NATURE 179 (2002). Neuroimaging is also being used to study morality. *See, e.g.*, Jonathan Haidt, *The New Synthesis in Moral Psychology*, 316 SCIENCE 998 (2007).

[40] PINKER, *supra* note 39, at 181 (emphasis in original).

minimally-conscious Michael Martin, he had to explain to the judge that the fact that Michael smiled in seeming response to questions and touching did not mean that he was enjoying or even understanding the questions in particular, or life in general. The fact was that Michael Martin simply smiled a great deal. Michael was severely injured in an accident that took his daughter's life. To demonstrate his lack of awareness and the meaninglessness of his smiling, Ron twice asked him the cruel question: "Do you know that your daughter Melanie died in the accident?"[41] Both times, Michael smiled. As Ron successfully explained to the judge in that case, Michael's smile was a cortical reaction to "any emotion he felt . . . [his smiles] did not reflect happiness, he smiled for anything."[42]

No one will be able to read the articles in this collection without a deeper understanding that information, especially in the form of a picture, is not knowledge; that using such information in the legal system is invariably complicated; and, that in the case of functional neuroimaging, understanding is still in its early infancy. If Ron was still alive, I am sure he would want me to add that neuroimaging is a potentially powerful tool, but it is only a tool. The challenge to physicians, psychologists, researchers, lawyers, and judges alike is to use our new tools in ways that make the world a better place to live for real people and real families. I think that thought would bring a smile to Ron's face.

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[41] Conference on the Terri Schiavo Case: One Year Later, *supra* note 3.

[42] *Id.*