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FEATURE

NEUROSCIENCE AND THE LAW
CUTTING-EDGE ISSUES FOR 21ST CENTURY JUDGES AS GATEKEEPERS

In our courtrooms, law and science intersect to search for the same goal—the truth. Twenty-first-century judges make rulings within this truth-seeking environment, which "integrates a sophisticated understanding of science into legal decision making."<1> In 1993, with the U.S. Supreme Court decision in Daubert v. Merrill Dow Pharmaceuticals, Inc.,<2> trial judges became gatekeepers who are responsible for evaluating the admissibility of scientific expert testimony for the underlying validity and reliability of the proffered scientific methodology. As gatekeepers of scientific evidence and other expert testimony, twenty-first-century judges are expected to know more about science-related issues. Although Daubert did not require judges to be trained as scientists, trial judges in the twenty-first century are expected "to be sophisticated consumers of science."<3>

The courtrooms of twenty-first-century judges are arenas where adversarial parties present scientific expert testimony and where judges must decide the legal issues derived from such expert testimony regarding the admissibility and reliability of the science involved. Neuroscience is one of the areas with cutting-edge legal issues for judges to decide. Neuroscience is defined by the Society for Neuroscience as "the study of the nervous system—including the brain, the spinal cord, and networks of sensory nerve cells, or neurons, throughout the body."<4> Through their research, neuroscientists seek to "describe the human brain and how it functions normally, to determine how the nervous system develops, matures, and maintains itself through life, and to find ways to prevent or cure many devastating neurological and psychiatric disorders."<5>

Prosecutors, law enforcement, defense counsel, and experts across our nation are presenting scientific expert testimony involving neuroscientific tools such as brain imaging to fulfill their burdens of proof or to use as mitigating factors in criminal cases. To date, U.S. prosecutors have not utilized brain imaging to convict defendants; rather, defense counsel have been successful in admitting the results of brain scans to demonstrate, for instance, their client's level of mental impairment.

Moreover, neuroscientific methods such as brain scanning have been introduced in courtrooms around the globe. Recently in the New York Times, one headline read: "India's Novel Use of Brain Scans in Courts Is Debated."<6> A judge in India at a bench trial had convicted a defendant of murder by "explicitly [citing] a [brain] scan as proof that the suspect's brain held 'experiential knowledge' about the crime that only the killer could possess, sentencing her to life in prison."<7>

The technology used in this case is known as the Brain Electrical Oscillations Signature test, or
BEOS. The BEOS test was developed by Champadi Raman Mukundan, a neuroscientist who formerly operated the clinical psychology department of the National Institute of Mental Health and Neuro Sciences in Bangalore. This technology evolved from work initially produced at American universities by other scientists such as Emanuel Donchin, Lawrence A. Farwell, and J. Peter Rosenfield. Brain scanner evidence purportedly reveals images of the human mind in action to detect signs that a suspect remembers details of a crime. Such software has been hailed as capable of distinguishing memories from the normal cognitive areas of the brain.

According to scientists Henry T. Greely and Judy Illes, the possible benefits of such neuroscientific technologies are vast: "As we enter more fully into the era of mapping and understanding the brain, society will face an increasing number of important ethical, legal, and social issues raised by these new technologies."<8> Moreover, as brain scans are admitted into the "laboratories" of our courtrooms, Greely and Illes foresee that "the legal issues alone are enormous, implicating at least the First, Fourth, Fifth, Sixth, Seventh, and Fourteenth Amendments to the Constitution."<9> Twenty-first-century trial judges must decide these complex legal issues and their relevance to the matters before the court before admitting brain scanner evidence. Critics believe that independent studies and peer review still need to be performed before admission of brain scan evidence is permitted for law-related purposes.<10>

The cooperation between the worlds of law and science is not a new phenomenon. Judges have viewed science historically "as an indispensable ally in a shared project of truth-finding."<11> Even classical literature displays examples of ancient scientists working within the worlds of law and science. Archimedes and his famous shout of "Eureka!" as he ran from his bathtub to the streets of Syracuse demonstrate the functional role law and science have played to further the search for the truth. Archimedes, a scientist, had been commissioned by King Hiero to prove the guilt of the King's goldsmith, who had allegedly defrauded the King by "adulterating the gold content of the crown."<12> Through the use of the water in his bathtub, Archimedes discovered how to weigh the "gold" content of the King's crown to prove the guilt or innocence of the King's goldsmith, demonstrating how the intersection between the worlds of law and science in this ancient forensic science experiment led to the discovery of the first law of hydrostatics. Justice and science must continue to coexist consistently with this precedent for the good of society; our concern should be for the integrity of the environment of our courtrooms that good science can help us maintain--"and unless a proceeding has the appearance of fairness, it may be impossible to preserve its integrity."<13>
The law's interdependence on science is also displayed through this early account from the Talmud from around the sixth century BC.

A husband, desiring to divorce his wife, contrived to get her and other guests drunk at a party, carried her and a male guest to a couch, and threw egg albumen between them. He then called the neighbors to bear witness to adultery.<14>

According to Jasanoff,<15> the wife was so resourceful that, upon sobering up, she enlisted the help of an expert, a physician, who stated that this fluid was not seminal fluid, but instead egg white. Jasanoff theorizes that "[w]e are not informed what tests the doctor used or whether the husband sought to escape his predicament by resorting to any form of counter-expertise. Perhaps the conflict ended because no one thought to question the medical expert's positive identification." <16>

Judges themselves must possess sufficient knowledge to evaluate the science and technology within the experts' opinions. If judges are not adequately trained in specific areas of science such as neuroscience, they may, when ruling on pretrial motions involving scientific issues, become lost attempting to evaluate the reliability of the methodologies utilized by experts.<17> According to Gatowski and Dobbin, "Indeed, current practice and training of the judiciary may not sufficiently prepare them to perform the role of scientific evaluator."<18>

The Carnegie Commission on Science, Technology, and Government has warned:

Critics have objected that judges cannot make appropriate decisions because they lack technical training, that jurors do not comprehend the complexity of the evidence they are supposed to analyze, and that the expert witnesses on whom the system relies are mercenaries whose biased testimony frequently produces erroneous and inconsistent determinations."<19>

The Carnegie Commission reported that the need is urgent for judges to make appropriate decisions, as the public's perception of justice is dependent upon it: "If these claims go unanswered, or are not dealt with, confidence in the judiciary will be undermined as the public becomes convinced that the courts as now constituted are incapable of correctly resolving some of the most pressing legal issues of our day."<20>

The sense of urgency is being met through a number of education curricula sponsored by numerous federally funded agencies. Educational courses have been offered to judges to heighten their
awareness of scientific concepts within disciplines of science such as neuroscience. For instance, the American Association for the Advancement of Science (AAAS), an international nonprofit organization advancing science around the world, recently hosted a "Judicial Seminar on Neuroscience." AAAS provided both federal and state trial judges with opportunities to attend this seminar specifically targeted to teach judges about current issues regarding memory and addiction that arise at the intersection between **neuroscience and the law**.

Another entity offering educational programs in the field of neuroscience is the Gruter Institute for Law and Behavioral Research, a nonprofit organization created to bring legal scholars, judges, and neuroscientists together to discuss new discoveries pertaining to the brain and also to conduct experiments applying the latest techniques in neuroscience to the problems of law and justice. Gruter's research includes functional Magnetic Resonance Imaging (fMRI) scanning projects developed to better understand moral decision making and legal rule applications. These projects are being conducted at the University of London and Humboldt University in Berlin, Germany. Gruter, in cooperation with the National Judicial College (NJC), offers a course entitled "Neuroscience for Judges," in which judges are taught how to identify the potential and the limits of neuroscience to help with challenges of the law in the courtroom. Judges also learn how to define the implications of brain injury for criminal behavior and responsibility, how to describe the forensic implications of psychopathology and their implications for the law, and how to understand what neuroscience can tell us today and what it might be able to tell us in the future.

At the forefront is ASTAR, the Advanced Science and Technology Adjudication Resource Program, a national program designed to prepare judges to preside over cases involving complex scientific issues. ASTAR is considered a consortium project of the Supreme Court of Ohio, the Court of Appeals of Maryland, the Supreme Court of Illinois, and the Supreme Court of Washington State. Thirty-nine jurisdictions participated in 2007 as ASTAR members, forty-three judges have become ASTAR Fellows, and seven judges are honorary Fellows. ASTAR has prepared judges to understand the impact of the human genome project by introducing them to genetics, molecular biology, biotechnology, and genetic engineering. Congress commissioned ASTAR in 2006 to provide judges with scientific education on a national scale. ASTAR added the entire spectrum of science, technology, and forensics matters likely to be introduced as evidence or to arise in the context of issues in the trial and appeal of complex cases.

The old adage is we became lawyers because we were not proficient in science or mathematics. In fact, when we were college students deciding to follow law as a career path, we were advised to
major in humanities rather than science or mathematics. While in law school, most professors only made reference to scientific tools such as DNA and fingerprints as they applied to basic criminal law concepts and maybe a few other legal issues. As law students, many of us were not trained to analyze and dissect scientific evidentiary issues to test the validity and reliability of scientific methodologies. With the advent of Daubert, twenty-first-century judges are expected to know more about science. Many programs such as ASTAR exist to teach judges about the numerous issues arising from the intersections between the worlds of law and science. ASTAR resource judges will be available within each state for judges who are not trained in scientific issues to call upon to discuss and assist them in resolving complex scientific litigation issues.

Judges also have the option of appointing their own experts to assist them in understanding scientific principles and concepts in disciplines such as neuroscience. In General Electric Co. v. Joiner, Justice Breyer observed that "[a] judge could better fulfill this gatekeeper function if he or she had help from scientists. Judges should be strongly encouraged to make greater use of their inherent authority . . . to appoint experts. . . . Reputable experts could be recommended to courts by established scientific organizations, such as the National Academy of Sciences or the American Association for the Advancement of Science."<21> Justice Breyer cited and quoted relevant portions of Federal Rule of Evidence 706 (FRE 706), and also referenced well-known treatise writer and federal district court Judge Jack B. Weinstein, who indicated that "a court should sometimes 'go beyond the experts proffered by the parties and 'utilize its powers to appoint independent experts under Rule 706.'"<22> Justice Breyer concluded that "[g]iven this kind of offer of cooperative effort, from the scientific to the legal community, and given the various Rules-authorized methods for facilitating the courts' task, it seems to me that Daubert's gatekeeping requirements will not prove inordinately difficult to implement and that it will help secure the basic objectives of the Federal Rules of Evidence, which are, to repeat, the ascertainment of truth and the just determination of proceedings."<23>

In addition, the use of court-appointed experts under FRE 706 or equivalent state rules may facilitate judicial independence. In 1996 Justice Breyer wrote:

In the United States, judicial independence has developed into a set of institutions that assure that judges decide according to law, rather than according to their own whims or to the will of others, including other branches of the government. The five components of judicial independence are: the constitutional protections that judges in the United States have; the independent administration of the judiciary by the
judiciary; judicial disciplinary authority over the misconduct of judges; the manner in
which conflicts of interest are addressed; and the assurance of effective judicial
decisions.<24>

Thus, judges in the twenty-first century who exercise their power to appoint experts may also be
helping to ensure the independent judiciary which, according to Justice Breyer, ". . . is the basis for a society governed by the law."<25>

The mere presence of the court-appointed expert may even keep the parties' experts from taking
extreme positions before the fact finders. Court-appointed experts may also aid the court and the
parties in either narrowing the issues before the court or in resolving or settling the entire matter.

Twenty-first-century judges must be armed with science in order to fulfill their roles and
responsibilities as gatekeepers. Whether trial judges seek out court-appointed experts or other
resource judges to assist them, the career path of a twenty-first-century judge must include a
familiarity with science. As neuroscience develops and progresses, judges should be adept at
delving into the legal issues within the areas of prediction, litigation, confidentiality, and privacy
and patents. With the study of neuroscience, judges are rapidly increasing their knowledge of the
functioning and the malfunctioning of the human brain.<26>

The Gruter Institute and similar entities foster research in law and biology and provide educational
components for judges. Their members believe "that a more sophisticated understanding of the
brain can eventually help us to sort out the validity of competing and complementary theories of
human behaviour. On a more pragmatic level, brain technologies promise to improve the legal
system's delivery of justice."<27> "Science and medicine do not stay still," said Franklin M. Zweig,
the president of ASTAR.<28> His organization's aim in recruiting judges nationally for his education
programs is to "develop more confidence in the judicial system; and if you have judges and juries
making decisions based on faulty scientific background, you don't have fair trials or fair appeals." <29> The ASTAR project aims to develop a corps of 500 active, specialized judges by the year
2010. Dr. Zweig indicated each individual state will create a system for deploying its own judges. In
Ohio, Chief Justice Thomas J. Moyer hopes the medical profession "will find comfort in the fact
that there is a developing group of judges who understand enough about the science of medicine to
be better gatekeepers. . . . Because at the end of the day, what we all want is for the judgment to
be based on the very best information available."<30>

At a recent conference sponsored by the NJC, Dana Foundation, and AAAS, judges emphasized that
issues linking neuroscience are already emerging in courtrooms throughout the country. One such case was offered by Judge Brian Boatright from Jefferson County, Colorado. Judge Boatright recently presided over a bank robbery case in which defense counsel raised the issue of legal insanity and cited brain development deficits in their juvenile clients. According to Judge Boatright, "The basic understanding provided at the seminar was tremendously helpful in raising the baseline of our knowledge. . . . It gave us a heads-up on what's coming down the line."<32> Another judge, District Court Judge Deborah E. Schumacher of Nevada's Second Judicial District in Reno, similarly opined, "In a couple of generations, we're going to have a much different jurisprudence than we have now."<33> Judge Schumacher continued by stating, "I don't know what it is going to look like, but it's going to look different than what we have now."<34>

Twenty-first-century judges as gatekeepers are expected to maneuver through the myriad of complex scientific issues to discern "junk science" from reliable science. Neuroscience holds the promise of unlocking the many doors and compartments within the three-pound organ we call the brain. Judges need to know the options available to navigate through the circuitry and pathways of the human mind. Moreover, legal issues continue to appear on the frontiers of knowledge. Justice must never be blind to science, and judges are increasingly empowered to seek expert advice and training to help them see and understand science.

Endnotes

1. DAVID FAIGMAN, DAVID H. KAYE, MICHAEL J. SAKS, & JOSEPH SANDERS, SCIENCE IN THE LAW, at v (2002).


3. FAIGMAN, supra note 1, at vi.


5. Id.


7. Id.

8. Id.
9. Id.

10. Id.


12. MORRIS L. COHEN, NAOMI RONEN, & JAN STEPAN, LAW AND SCIENCE, at viii-ix (Vivien B. Shelanski & Marcel C. La Follette eds., 1980).


14. JASANOFF, supra note 11, at 42.

15. Id.

16. Id.


20. Id.


22. Id.

23. Id.


25. Id.


29. Id.

30. Id.


32. Id.

33. Id.

34. Id.

GRAPHIC:
Illustration; Photo 1 of Hon. Stephanie Domitrovich, Ph.D.; Photo 2 of Dr. Mara L. Merlino, Ph.D.

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