Forensic Psychiatry, Neuroscience, and the Law

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The rise of modern neuroscience is transforming psychiatry and other behavioral sciences. Neuroscientific progress also has had major impact in forensic neuropsychiatric practice, resulting in the increased use of neuroscientific technologies in cases of a psychiatric-legal nature. This article is focused on the impact of neuroscientific progress in forensic psychiatry in relation to criminal law. Also addressed are some emerging questions involving the practice of forensic neuropsychiatry. These questions will be reframed by providing alternative perspectives consistent with the objectives of forensic neuropsychiatric practice. The last part of the article is a discussion of potential developments that may facilitate the integration of neuroscientific knowledge in forensic neuropsychiatric practice.

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Forensic neuropsychiatry is an area of forensic psychiatry that addresses the relationship between psychopathology and neuropathology and its relevance to the law.[1,2] Forensic neuropsychiatric practice makes use of multiple approaches, which include neuropsychological testing, neuroscientifically based technologies such as neuroimaging and electroencephalography, and the assessment of physical abnormalities via neurological examination. It may also involve the use of technologies derived from the field of molecular genetics and computer science and both theoretical and practical approaches derived from fields such as developmental psychology and bioinformatics. Like other neuroscientific fields,[3–5] forensic neuropsychiatry faces the fundamental challenge of identifying and integrating the complex relations between brain function, mind, behavior, and social phenomena. This challenge was recognized by 19th century scientists and articulated by the psychologist William James in 1890 when he stated:

> A science of the mind must reduce complexities (of behavior) to their elements. A science of the brain must point out the functions of its elements. A science of the relations of the mind and brain must show how the elementary ingredients of the former correspond to the elementary functions of the latter [Ref. 6, p 28].

Since the time of William James, the neurosciences have made impressive progress, a record that includes areas of forensic neuropsychiatric importance.[3,7] Despite these advances, there is substantial concern regarding the relevance of neuroscientific knowledge to forensic psychiatric assessment, both with its theoretical underpinnings and practical interventions.[7–14] This article is focused on forensic neuropsychiatric topics of potential relevance to criminal law. It has three objectives. First, some important concerns will be delineated involving the use of emerging neuroscientific knowledge in forensic neuropsychiatric practice. The second objective is to reframe these concerns from various alternative perspectives. The last objective is to provide an overview of various factors and emerging developments that may facilitate the integration of neuroscientific knowledge with forensic psychiatry, such as the introduction of evidence-based psychiatry, the adoption of emerging neuroscientific paradigms, and neuropsychiatric training.

The Nature of Causation in Forensic Neuropsychiatry

Delineating neuropsychiatric factors in forensic psychiatric settings involves a search for both psychological and brain-related deficits. From this perspective, the origin of criminal behavior is viewed as having a multiplicity of causes. Furthermore, their psychiatric-legal value must ultimately be linked to their potential evidentiary role in aiding the trier of fact in making judgments about such matters as re-

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sponsibility and culpability, in accordance with the law.

A major reason that modern psychiatry is becoming increasingly relevant to criminal law involves the adoption of an integrative spatiotemporal perspective that has influenced the development of psychiatry during the past few decades. The term integrative spatiotemporal perspective refers to the notion summarized by the philosopher Johns Searle's statement to the effect that, "All events in the real world occur in physical space and time" (Ref. 5, p 117). An integrative spatiotemporal paradigm is a comprehensive way of integrating information involving human beings, their environment, and associated components (i.e., the brain, socioeconomic status) and it must acknowledge their existence in space as a function of time.

Furthermore, progress in the psychiatric sciences has increasingly relied on two basic interdisciplinary strategies. The first is strongly informed by the biological sciences and includes ideas and methodologies derived from molecular and cell biology, organismic biology, evolutionary biology, as well as from other branches of medicine. This strategy also merges information and paradigms from behavioral sciences that have had a formative role for psychiatry, and include the fields of psychology and anthropology. The second strategy focuses on human organization as a function of time. This approach is exemplified by studies that require behavioral measurements over short periods, as typified by psychotropic drug trials, by the study of human development at the level of individuals and small groups such as the family,[16] and by life-span paradigms that focus on cohort studies involving long-term effects due to large-scale events such as the great depression or major natural catastrophes.[17]

Given the increasing prominence of these approaches in modern psychiatry, normal behaviors and psychiatric disorders and associated physical correlates are conceptualized as originating and being located in three-dimensional space, undergoing real-world changes as a function of highly complex time-dependent contexts. Most important is that the resultant perspective views people and their components as part of an interconnected organizational framework composed of multiple levels of biopsychosociocultural organization.[1,3,4,15]

These developments are giving psychiatry more societal influence but also more scrutiny. Such scrutiny is particularly focused on forensic psychiatry due to its intrinsic relation with the legal system and its robust orientation to the social world. Given the social dimension of forensic psychiatry, component areas that are likely to experience considerable growth, such as forensic neuropsychiatry,[1,2] are even more likely to be scrutinized.

An important critique concerning the use of neuroscientific knowledge in forensic psychiatry focuses on the nature of causation and rationality. For example, the legal scholar Stephen Morse is under the impression that forensic psychiatric professionals frequently confuse neuropsychiatrically based causation with lack of responsibility, an analytical error that results in mistaken impressions concerning culpability. He calls the resultant mistake "the fundamental psychological error" (Ref. 12, p 180).

I agree with the view that the fundamental psychological error is an important analytical error that must be addressed by the neuroscientifically informed forensic psychiatrist. However, the nature of the causes surrounding the question of responsibility necessitates at the very least that such a concern be viewed from the perspective of both brain and psychosocial levels of organization. Therefore, a forensic neuropsychiatric perspective that takes into account the causes of responsibility also requires that those causes be viewed in relation to the general level of the brain, or otherwise, in relation to one or more areas within the brain. At psychosocial levels of organization, relevant causes of responsibility also should be clarified with the information that has been made available to the forensic psychiatrist.

Also, forensic neuropsychiatry must recognize that while its goal should be to delineate as clearly as possible the potentially legally relevant causes of mental dysfunction directly related to cerebral dysfunction, our current level of neuropsychiatric knowledge tends to involve relatively indirect information derived from correlational studies between brain and psychologically defined factors. However, it is also true that despite these limitations, many neuroscientifically oriented fields have already made impressive progress in areas of practical and theoretical value for forensic neuropsychiatric practice.[18–21] These advances constitute a trend that is likely to gain momentum in the foreseeable future. Given this situation, we will be better served if we address the fundamental psychological error by inquiring under what conditions, if any, localizing a brain abnormal-

ity may be of potential forensic psychiatric value. I also agree with the view that the resultant analysis is likely to be most helpful if we attempt to characterize a neuropsychiatric abnormality from interconnected neurobiological, behavioral, and psychiatric-legal perspectives. Furthermore, a realistic and effective approach regarding psychiatric-legal concerns about responsibility must also take into account questions that reach far beyond monolithic notions about rationality. Therefore, forensic psychiatry should adopt strategies that minimize involvement with absolutistic contentions that tend to confuse psychiatric-legal matters and discourage relevant discourse.

The Uses and Misuses Concerning Theories of Folk Knowledge

Human knowledge is differentially formalized into various domains that may eventually become the object of scientific study and that have resulted in the development of rigorous scientific disciplines such as biology, psychology, and physics. However, some types of knowledge are thought to be intrinsically dependent on common sense, and characterized by a tendency to resist formal classification and systematic scientific study. In recent times, this type of knowledge has often been referred to as folk knowledge. From this viewpoint, the demands of everyday life or the task at hand rely on specific domains of folk knowledge, as exemplified by folk physics,[22–24] folk law,[25] or folk psychology (FP).[24,26–29]

Folk psychology is an important type of folk knowledge that, during the past few decades, has become the object of increasing scholarly interest and intense debate in many scholarly disciplines, such as the philosophy of mind,[22,24,26] cognitive neuroscience,[23,24,30] and criminal law.[12,13,31,32] One important reason FP has become the object of both interest and controversy derives from frequent claims concerning its universal validity, monolithic nature, and a seemingly irreducible architecture. To my mind, regardless of the particular convictions that we may have about FP and the plethora of disagreements surrounding it, FP encompasses a complex multidimensional behavioral psychological picture, a characteristic that it shares with scientific psychology (SP). FP and SP appear to share another important characteristic in that they are both associated with explaining and predicting human behavior.[33] A commonly held view about FP is that it is particularly impressive in its ability to predict human behavior across multiple social settings.[33] However, this view must be tempered with another dominant perspective concerning the nature and limitations of FP, a perspective that maintains that FP explains and predicts human behavior from the vantage point of the particular, while SP focuses on explanations and making predictions at a more general level.[33] Another important contention is that folk and scientific knowledge are not completely ontologically unrelated,[22] a point underscored by the process by which folk knowledge is replaced by scientific knowledge.

The importance of folk psychology for forensic psychiatry is that FP appears to be closely linked with the development of the rules of law and with the way in which important components of the legal system, such as juries, reach an understanding concerning the potential importance of psychiatric assessments and testimony.[31,34] Morse[12,31] has advanced an increasingly influential perspective involving the nature of FP, the neurosciences and their importance to both psychiatry and the law. His position is highlighted by the statement:

> . . .folk psychological behavioral criteria are always the final pathway, the final standard that must be addressed, the ultimate legal question. All evidence, including what caused the behavior, must help answer the folk psychological questions that the law asks. The law concerns acting agents, not mechanisms [Ref. 31, p 211].

However, the frequent and longstanding use of neuropsychiatric expertise in criminal legal settings indicates that both psychiatric and neuroscientific concepts and knowledge point to its legal relevance, even if ultimate questions posed by the law are exclusively viewed from notions involving acting agents. To this consideration, I must add that philosophical theories concerning the relationship between personhood and folk psychology deal with many complex factors that, from an empirical perspective, are poorly understood. Not surprisingly, philosophical analyses of these theories often lead to a multiplicity of perspectives that not infrequently also mirror the expectations, desires and illusions of the beholders. To my mind, a reasonable perspective suggests that the law seeks to recognize the universe of views and concerns that constitute the human condition, including those views that originate from science. From this perspective, the law at its best concerns itself with both acting agents and mechanisms and not with acting agents without mechanisms. Finally, I also must emphasize that those theories that view folk psychology

as a primary epistemological domain of the law may be open to question and may in fact be incorrect.

We should also be aware of the possible existence of powerful social dynamics and ideologies whenever we consider potential misuses concerning the nature of folk psychology. More specifically, we must be concerned about the potential misuse of folk psychological concepts involving both explicit and implicit claims of universal validity. This possibility is especially disturbing if we take into account that many components of a folk psychological nature may be difficult if not impossible to recognize, and may effectively resist objective, systematic, scientific, or otherwise responsible scrutiny. If my contention is true, then numerous biased and downright prejudicial views against certain persons or groups may find a welcome haven under poorly founded conceptions that assign substantial relevance to folk psychology for the conduct of the law.[35–37] This concern is not merely theoretical but is realistically oriented and resonates well with the forensic psychiatrist Ezra Griffith's statement that, "It is an acknowledged reality that a profound unfairness permeates the American criminal justice system and lands disproportionally on the head of some nondominant groups" (Ref. 37, p 202).

My concerns about FP should not be taken as a rejection of the existence or relevance of FP for human affairs and for the law. On the contrary, there is evidence in support of FP and its important role for the law.[32] Furthermore, some aspects of FP can be effectively studied at the neuroscientific level, especially folk psychological factors that characterize the early life cycle, where the possibilities of confounding them with environmental factors can be minimized.[23,38,39] A specific example of these components of FP involves the predisposition to recognize biological motion and to differentiate it from nonbiological motion by newborn babies.[39] Another example involves the study of the development of mentalizing (theory of mind) abilities in young children.[23,38] Although the association between FP and the law can be effectively studied, its results must be more carefully scrutinized because of the likely presence of potentially confounding psychosociocultural factors that could make the interpretation of these results a problematic undertaking. Given these considerations, I agree with the philosopher Daniel Dennett, when he states that, "The *theory* of folk psychology is the ideology about the craft, and there is lots of room, as anthropologists will remind us for false ideology" (Ref. 22, p 82; italics in original). I am essentially concerned about the potentially destructive impact involving the use of unjust, uninformed, or otherwise naïve conceptions regarding the nature of folk psychology.

The Contextual Nature of Responsibility

Forensic psychiatrists work within a legal framework that is normative in that laws tend to be norm-based propositions within highly complex hierarchical infrastructures. The normative reach of criminal law also encompasses ongoing developments concerning the nature of rationality, responsibility, and culpability as they apply to persons.[40] However, normative paradigms of human behavior are also a subject of primary interest for the sciences, including the behavioral sciences and psychiatry.[41–43] Finally, an equally important consideration is that both norms and classifications concerning the social construction of the person often comprise a political process that drives discourse concerning the nature of power, including power relations that define the person, its normative architecture, and deviations from the norm. Such a power-facilitated process may have positive or negative impacts on numerous groups within society,[44,45] including forensic psychiatrists. Therefore, forensic psychiatric notions about the person, including those of a social neuroscientific nature, must be viewed from the perspective that failure by forensic psychiatry to participate in relevant discourse may place forensic psychiatry and those whom it serves at considerable disadvantage.

Because forensic psychiatry by its very nature must work within the framework of the law and because the law has a major interest in the nature of responsibility, important areas of forensic psychiatric endeavor, such as forensic neuropsychiatry, must also deal with the nature of responsibility. However, those who view responsibility from an overly constrained perspective risk missing opportunities to engage in necessary dialogue concerning the value of neuroscientific knowledge for forensic psychiatry. From my perspective, both the forensic psychiatric profession and the criminal justice system endeavor to take into account informational components of a psychological (i.e., both behavioral and mentalistic) or neurobiological nature. Also, they can consider information with closely linked psychological and neurobiological components. But most important,

this perspective views both forensic psychiatry and the criminal justice system as functioning within a complex informational infrastructure, with connections not only between levels of biopsychosociocultural organization (i.e., an individual human being and the proximal social environment), but also within a specific level of biopsychosociocultural organization (i.e., the individual person and important subcomponents such as the brain). However, relevant discourse concerning neuroscientific applications to matters of forensic psychiatric importance often misses these points. This problem is exemplified by Gazzaniga and Steven when they state that, "This is a fundamental point. Neuroscience will never find the brain correlate of responsibility because that is something we ascribe to humans, not brains. It is a moral value we demand of our fellow, rule following beings. . ." (Ref. 10, p 68). Gazzaniga also maintains that, ". . .neuroscience can add little to our understanding of responsibility because responsibility is a human construct that exists only in the social world, where there is more than one person. It is a socially constructed rule that exists only in the context of human interaction. . ." (Ref. 11, p 100). At least to some extent, Morse subscribes to this perspective, stating that "Brains are not held responsible. Acting people are" (Ref. 13, p 405).

Gazzaniga and Steven[10] are, of course, correct, in that they endeavor to avoid a category error by firmly placing the concept of responsibility within the social context of persons. There is, however, much more about the fundamentality of this important point, if psychiatric disorders (including neuropsychiatric disorders) as defined according to the nosologies of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR)[46] are considered. First, psychiatric disorders involve psychopathologies and associated disabilities. Second, those disabilities occur in socially interacting persons. Third, mentally ill, socially interacting persons may have psychiatric disabilities that impair social responsibility. Fourth, persons with neuropsychiatric disabilities involving impaired social responsibility may have to be psychiatrically assessed from a forensically oriented biopsychosociocultural perspective. Persons with such disabilities must be assessed at a minimum from at least three levels of biopsychosocial organization: the psychological, the social, and the neurobiological. Fifth, failure to adopt an integrative approach between and within those three levels may also lead to category errors, inadequate data collection, substandard assessments, and poor health care. Sixth, in a forensic neuropsychiatric setting, failure to adopt an integrative approach may also impede the path to justice. Seventh, I must emphasize that addressing Gazzaniga and Steven's fundamental point in psychiatric-legal settings requires practical solutions, a real-world approach including forensic neuropsychiatric competency. Therefore, we must also endeavor to evaluate the relevant cases by balancing the need for technically sound assessment with a sensitive appreciation of the world's limited resources. Eight, responsibility is not the exclusive domain of any discipline. Therefore, we should continue to clarify the existing universe of meanings concerning responsibility both within and across disciplines. With regard to the relation between neuroscientific knowledge and forensic psychiatry, it is imperative that relevant discussion attempt to differentiate whether dialogue concerning responsibility is situated in or out of the courtroom. Finally, given the importance of Gazzaniga and Steven's point, it behooves interested professionals to articulate important concerns posed by the previously enumerated points, including their potential solutions.

Arguably, Gazzaniga and Steven's main concern may also be pointing to a dividing line that is often demarcated by epistemological, ideological, and politically biased concerns and that extends well beyond notions concerning persons and responsibility. This consideration is part of the reason why an optimal understanding of neuropsychiatric determinants of criminal behavior may require that we view forensic neuropsychiatric information from a broadly informed but highly systematic biopsychosociocultural perspective that conceptualizes criminal behavior as being due to a multiplicity of causes at many levels of organization and reciprocal causation.[4] This perspective resonates well with the neurophilosopher Paul Churchland, who remarked that criminal behavior:

> . . .can stem from chronic failures in social perception, from an inability to empathize with others, from a contorted emotional profile, from weird and overpowering desires, from chronic difficulties in practical reasoning, and from the lack or corruption of normal socialization, from sheer desperation, from sheer cussedness, from any combination of these. And from a hundred other things we have yet to appreciate [Ref. 47, p 310].

This view must also be contrasted with criminological approaches that, in general, have adopted a narrow focus in their study of criminal behavior and that

favor the use of a limited number of working perspectives. Buffkin and Luttrell have summarized this trend by stating:

> Historically, the paradigms guiding criminological problems of study have tended to bypass this complex web of interconnections that produce and reproduce criminality, favoring instead an emphasis on one dimension or level of analysis. The trend has been to maintain a specialized focus, often within the confines of a social or legalistic model [Ref. 48, p 184].

While I realize that any field of scholarly endeavor is limited by its own epistemological foundations, the multidisciplinary perspectives increasingly adopted by the social neurosciences are likely to provide increased opportunities for developing more ecologically valid constructs within the practice of forensic neuropsychiatry.[6,49]

Emerging Paradigms in Forensic Neuropsychiatry

Our society places a great premium on our ability to use rationality to resolve many of its problems. An emphasis on rationality is also evident in American jurisprudence, a characteristic highlighted by current insanity laws in the United States, which also incorporate a robust cognitive component. A historically discernable emphasis also exists in clinical neuropsychology, a field that favors the use of paradigms from cognitive psychology and the psychometric measurement of cognitive factors. Cognitive psychology also has had a major influence in the development of the neurosciences.

Consequently, the clinical neurosciences have inherited this cognitive focus, a development that has resulted in a relative lack of approaches necessary for an effective assessment of forensic neuropsychiatric cases associated with pathologies of affect. The resulting dearth of effective tools and concepts necessary for understanding and measuring affective psychopathology in forensic neuropsychiatry constitutes a fundamental problem in great need of attention. However, a balanced assessment of the problem must acknowledge that it has begun to be addressed in a more concerted fashion during the past 10 years, resulting in considerable growth in the disciplines of affective psychology and affective neuroscience. These disciplines have made significant progress in their search for neurobiological factors underlying affective behavior and in clarifying the relation between affect and cognition.[4,5,50,51] For example, the work of Yamasaki and colleagues[52] with functional magnetic resonance imaging (MRI) has shown that there is a prefrontal human brain system consisting of functional components that process emotion and attention, and which are also anatomically differentiated into ventral and dorsal components. These functional components also become anatomically integrated in the anterior cingulated gyrus.[52] These characteristics support the view that functional mechanisms associated with cognition and affect can be anatomically differentiated, depending on specific locations in a network within the brain. Further research in the affective neurosciences may also challenge the current emphasis on cognition in the neurosciences and criminal law, a development that may result in a more objective and effective understanding of forensic neuropsychiatric cases with prominent affective psychopathology. Improved forensic neuropsychiatric assessments of cases with substantial affective psychopathologies, may, for example, result in improved legal outcomes involving mitigation. Mitigation appears to be an area of the law that allows for a more prominent consideration of affective psychopathology.[44]

The term theory of mind (ToM) refers to a complex set of abilities responsible for the effective recognition of beliefs, intentions, feelings, desires, and other mental states of others and of the self.[38,53] These abilities appear to be subserved by a neuronal network that includes the medial prefrontal cortex, the posterior cingulate, the bilateral temporoparietal junction, and the posterior temporal sulcus.[54] Other potential neurobiological components of this network may include parts of the orbitofrontal cortex[55] and the cerebellum.[56] Theory of mind deficits are associated with mental disorders such as the autism spectrum disorders,[53] frontal lobe lesions,[57] and schizophrenia,[58] raising the possibility that ToM deficits are closely associated with violent behavior in some individuals who have these disorders. ToM deficits may also be closely linked to psychological abnormalities of moral judgment in some cases with mental disorders involving violence. For example, a paranoid delusional person with schizophrenia, may mistake the mental state of an innocent bystander for that of a dangerous person who poses a physical threat. This delusional conviction, coupled with thought disorganization, may predispose the affected individual to attack the innocent bystander. In this case, a proper forensic psychiatric evaluation of ToM

abilities may necessitate a detailed assessment of mental symptoms potentially associated with ToM deficits, as well as the evaluation of the person with ToM tests.[59,60]

An optimal search for ToM abnormalities may also necessitate in-depth familiarity with the nature of empathy and with the psychology of moral judgment. Both empathy and the psychological bases of moral judgment may be dependent on ToM abilities.[61] Empathy is a phenomenon of psychiatric-legal significance that involves both cognitive and affective components. For example, psychologist Martin Hoffman[62] describes empathy as a vicarious affective response to another person. He also refers to a cognitive component of empathy, which he describes as a cognitive awareness of another person's internal state including his thoughts, feelings, and intentions. The intersubjective affective component is thought to be of primary importance. Empathy has been studied with brain imaging technology. The results of these studies suggest that the medial prefrontal cortex, the posterior cingulate, and various temporal regions form a brain network associated with the experience of empathy.[63] Decety and Jackson[64] postulate that empathy may be associated with an automatic affect-based bottom-up process that mimics the emotional expressions of others as bottom-up processing. The other component may be closely linked to cognition and corresponds to a top-down process, which involves the ability to place oneself within the inner experience of another.[64] The neuroscientific study of empathy is likely to increase our understanding of those mental disorders of psychiatric-legal significance known to be associated with deficits in empathy,[63,64] such as antisocial personality disorder and Asperger's disorder.[18,65] Both ToM and empathy deficits may become important forensic neuropsychiatric considerations, because they can seriously compromise a person's emotional appreciation of the mental anguish of people who are abused by others. The failure of persons with ToM and empathy deficits to identify emotionally with the needs of others, may place them at increased risk of engaging in criminal behavior.[18,65]

Remorse is an important concern for the criminal law, especially with respect to mitigation. Although the experience of remorse has yet to be neuroscientifically studied, recent advances in the neuroscientific study of closely related phenomena such as empathy[63,64] suggest that remorse may also become the subject of neuroscientific study in the near future. The development of an empirically based neuropsychiatric model of remorse may have far-reaching consequences for any discipline that must take into account a person's ability to experience remorse.

Psychiatry and other behavioral sciences have a long record of making significant contributions involving our understanding of the psychological nature of moral development, as exemplified by the work of Piaget[66] and Kohlberg.[67] This tradition continues to the present day, and in recent times the psychological nature of morality has become the object of intensive empirical study.[68–70] From a neuroscientific perspective, the psychological nature of morality also has been actively studied in recent years,[20,21,24,69] resulting in insights that may eventually lead to significant revisions concerning the psychological nature of moral judgment and reasoning.[24,69] Despite ongoing controversy concerning the relevance of psychiatry involving psychological aspects of moral judgment,[71–73] forensic psychiatrists frequently evaluate cases that involve assessments concerning the psychological and psychiatric nature of moral judgments. For example, forensic psychiatrists make use of both the revised form of the Hare Psychopathy Checklist-Revised (PCL-R)[74] and the DSM-IV-TR antisocial personality disorder construct[46] to identify psychopathic psychopathology. Both PCL-R defined psychopathy and DSM-IV-TR antisocial personality disorder are known to be associated with abnormalities in psychological components associated with processing moral judgment, such as lack of empathy and remorse, or with affective dysregulation.[18,70,75,76] Furthermore, the brain imaging literature and other neuropsychiatric studies support an association between psychopathic psychopathology and various neurobiological abnormalities.[18,19] Therefore, some neuropsychiatric cases involving psychopathic psychopathology may necessitate that the expert be able to discuss his findings in relation to the relevant neuropsychiatric literature.

Although moral psychology has become an important area of scientific study, it should be emphasized that it is the psychological investigation of morality that is the proper area of endeavor for the clinical neurosciences, forensic neuropsychiatry, and other sciences, and not the study involving the intrinsic philosophical nature of morality. Nonetheless, some neuroscientists believe that future progress in the em-

pirical study of moral psychology may eventually blur some of the boundaries that currently exist between psychological and traditional philosophical views concerning the nature of morality.[21,24,43]

Most significantly, the neurosciences are changing the nature of forensic neuropsychiatric discourse and practice with emerging studies concerning the neurobiological and psychological bases of moral judgment.[7,56,69,77] For example, in 2001, Greene and his colleagues[77] reported the first brain imaging study of moral judgment. They used a research design that searched for potential brain sites underlying moral judgment. The study identified activations in the medial frontal gyrus, the posterior cingulate area, and the left and right angular gyri that were associated with moral judgment. Moll and his colleagues[78] have also used functional (f)MRI brain imaging technology to study the potential neurobiological basis underlying moral judgment. They studied the capacity for moral judgment in normal subjects by using visual non-semantic stimuli. Their results support the idea that the capacity for making moral judgments involves a robust emotion-based component that is associated with a brain network that includes areas of the orbital and medial sectors of the prefrontal cortex and of the superior temporal sulcus. Essentially, the brain imaging studies on moral judgment support the thesis that the capacity for moral judgment is subserved by a broadly distributed cerebral network and that moral judgment may depend on substantial emotional input. More recent work suggests that moral judgment may depend on both affective and ToM architectures associated with differential activation of the right temporoparietal junction, an area of the brain thought to subserve moral judgment.[79] Neuroscientific advances involving the nature of moral judgment, ToM, empathy, and remorse can be viewed as part of an emerging paradigm that eventually is likely to become a significant driving force in the development of forensic neuropsychiatry.

Conceptual and empirical advances derived from interdisciplinary research involving areas such as cognitive and affective psychology, philosophy of mind, and the neurosciences are opening new avenues of study of important forensic psychiatric problems. For example, structural brain imaging studies have provided evidence in support of a relationship between antisocial behavior (i.e., also known as acquired sociopathy) and lesions in the prefrontal cortex.[80] These findings complement longstanding evidence linking orbitofrontal brain damage with antisocial behavior.[81] Yang and his coworkers[82] have used structural MRI and have shown that, compared with a healthy control group, persons with no known brain damage who have elevations in psychopathy, as measured by total PCL-R scores, and who are arrested for their antisocial behavior (i.e., unsuccessful psychopaths), have significant reductions in prefrontal gray but not in white matter volumes. Structural abnormalities of the amygdala also can result in a propensity toward aggression or in a diminished tendency to become involved in aggressive behavior. Also, some studies reveal evidence of amygdalar dysfunction in psychopathy.[18,81,82]

There is evidence that persons who present with elevated scores on the PCL-R also have disturbances in processing anxiety. Affective disturbances in psychopaths involve abnormally low levels of baseline anxiety.[18] An fMRI study has shown that, compared with a normal control subject, psychopaths have deficits in fear conditioning associated with a lack of activations in circuits that included the amygdala, orbitofrontal cortex, the insula, and the anterior cingulate.[83]

The Role of Functional Brain Imaging Technology in Forensic Neuropsychiatry

The rise of modern neuroscience has been associated with the development of many promising, though relatively new, technologies. Functional brain imaging exemplifies one such type of technology. The most important functional brain imaging technologies are positron emission tomography (PET)[84] and fMRI,[85] and both have played a pivotal role in the development of modern clinical neuroscience. Functional brain imaging technologies have led to important advances in our current understanding of many psychiatric disorders.[82–87] Functional brain imaging is also increasingly used in the legal system in the evaluation of cases of a forensic psychiatric nature, a trend that has led to intense concerns regarding the admissibility of the technology in the legal system.[8,9,14,19,88–91] Given the likelihood that brain imaging technology will continue to be used in the legal system, questions involving its admissibility should continue to generate debate. In this section, I will confine my discussion to several questions that have arisen regarding the feasibility of using brain imaging technology in the legal system.

An important question involving functional neuroimaging data is related to normalization and sample selection. Not infrequently, brain imaging studies use a low number of subjects for control and study groups, a situation that may seriously limit statistically acceptable comparisons between the two groups. Another problem may involve inadequate screening of individuals.[89] For example, failure to screen for recent drug abuse or to consider long-term drug effects may result in spurious findings and incorrect interpretations.[89] Similarly, a lack of comprehensive psychiatric diagnostic assessments may result in inadvertent inclusion of comorbid psychiatric conditions that also can compromise the neuropsychiatric validity of brain imaging information. Although these deficits can compromise the ability to differentiate normal from psychopathological states accurately, they may also be minimized by adhering to stringent screening procedures and by relying on appropriate diagnostic protocols. Many of the difficulties associated with brain imaging technology are inherent in the procedures involved in the reconstruction of the biological data into the visual information encompassed by the image. Since these procedures are not standardized, there is ample opportunity for making errors of interpretation. Factors such as threshold signals, color coding, and scanning machine architecture may all contribute to interpretational errors. Some of these factors, such as color coding, can be manipulated to give the impression of significant brain activation where little may exist.[89]

One of the most frequently cited problems surrounding the forensic psychiatric application of functional brain imaging involves statistical limitations inherent in using group brain data to interpret the brain scan results in an individual who shares the same type of psychiatric characteristics as that of the reference group. This limitation should be acknowledged in forensic neuropsychiatric evaluations, by describing in detail the imaging data and how it was generated and by providing an explanation of its statistical properties. However, if the brain imaging results of an individual are consistent with the results of aggregate psychological and imaging data from one or more comparison groups and if the results are supported or not contradicted by other relevant data from the index case, it may be possible or necessary to report an increased likelihood that the individual being assessed is an objective example, like those individuals who encompass the comparison group.[19,92]

To my mind, a realistic perspective concerning the interpretation of functional brain images in psychiatric-legal settings must take into account that forensic neuropsychiatric assessments form part of a complex process of which the neuropsychiatric component is only a part of the total evaluation. Second, it is important to emphasize that all aggregate data and all other information originating out of the individual, must undergo a series of interpretational transformations for that information to become intelligible as psychiatric knowledge and as knowledge that is relevant at the level of the individual. Furthermore, this information must then travel through another array of interpretational steps that result in opinions that are potentially acceptable to the law. Also, we must consider that the interpretation of information from the aggregate to the particular, involves both explicit and implicit assumptions regarding how a given source of information or opinion becomes epistemologically acceptable to psychiatry and to the law. We must also consider that while the relevant data are explicitly tagged with probability estimates, as formally exemplified by functional brain imaging data, it is also true that such data must be viewed in the context of a whole universe of relevant information. The totality of potentially useful information is associated with a wide range of formal and implicit probability estimates originating from psychiatric, legal, and other practitioners involved in the legal system. This situation accounts for the view of Yang and his colleagues regarding the use of brain imaging in court settings, when they state:

> Many of the arguments and limitations given appear to be based on the idea that brain imaging is used as a form of brain-print in isolation from all other evidence to unequivocally type an individual and demonstrate causality. However, brain imaging evidence can be considered in the same way as evidence from any other biological, psychological, or psychosocial source; brain structure and function can be viewed as one factor among many that may predispose to, increase probability of, or influence behavior [Ref. 19, p 79].

There is a great need for interdisciplinary collaboration concerning those problems that have originated with the forensic psychiatric use of brain imaging technology. They are closely related to questions regarding how and when a scientific area of study and the data that it generates become epistemologically or otherwise acceptable to the neurosciences, psychiatry, and the law. Therefore, resolu-

tion of this problem may derive benefit not only from forensic psychiatrists, neuroscientists, and legal practitioners, but also from historians and philosophers of science and of the law.

Equally important, problems associated with ineffective communication of brain imaging data require practical solutions. A practical perspective is necessary, given the increasing interest among brain imaging experts in conducting brain imaging studies for the legal system. For example, experts in functional brain imaging provide testimony concerning the nature of metabolic brain disturbances associated with various psychiatric diseases and by analyzing technical limitations associated with current functional brain imaging technology.[8,91] Furthermore, they often communicate their results and opinions without the benefit of preparing appropriately crafted psychiatric-legal reports. This situation persists despite existing knowledge on how to write competent forensic reports.[93] Forensic psychiatry has long recognized the benefit of writing a forensic psychiatric report. A primary reason for preparing a forensic neuropsychiatric report is that it requires the expert to describe and integrate relevant neurobiological and psychosocial information and to formulate objective and well reasoned opinions concerning psychiatric-legal matters in a highly organized manner. Therefore, experts who do not convey their findings and opinions via a forensic psychiatric report may place themselves at increased risk of conveying these findings and opinions in a less comprehensive and effective manner.

When brain imaging findings are provided without the benefit of an appropriately crafted forensic psychiatric report, the expert must formally convey his findings and opinions via testimony. However, this scenario raises another serious problem concerning the present status of testimony involving functional neuroimaging technology. Philosopher and neuroscientist Adina Roskies[94] calls it the problem of apparent inferential distance. From a psychiatric-legal perspective, it may occur if testimony involves data of a vivid visual nature. It may be inherent in the visual representational nature of brain scan images, because they convey not only the objective nature of functional neuroanatomic information, but are also accompanied by a multiplicity of representational elements (i.e., the brightly colored appearance of many functional brain scans). These elements may confuse juries and other components of the legal system and impel them to think that the visually appealing but subjective components of the images correspond to objective findings.[9,88,94] Research designed to determine the potential magnitude of this problem in brain imaging testimony is only beginning to appear.[95] Therefore, most aspects associated with inferential distance effects in functional brain imaging studies have yet to be scientifically assessed. Forensic psychiatry could make valuable contributions in this area by actively participating in the development of guidelines that deal with the admissibility of brain imaging technology in psychiatric-legal settings.

The Role of Education for Forensic Neuropsychiatry

Forensic neuropsychiatric competency may be optimally accomplished by undertaking formal training in both forensic psychiatry and neuropsychiatry. However, many psychiatrists may not have those options. Forensic psychiatric organizations may address training in forensic neuropsychiatric practice by taking a strong role in promoting the development of courses, workshops, and presentations of a forensic neuropsychiatric nature.

Although few forensic psychiatrists would contemplate undertaking formal training in neuropsychological testing, improving competency in this area should be addressed by forensic psychiatry since forensic neuropsychiatric assessment often demands detailed assessments of a neuropsychological nature. Training in the area of neuropsychological testing is an area of psychiatric education in great need of attention that is likely to become even more important as progress in the neurosciences continues to influence the nature of psychiatric practice.

Greater understanding of brain imaging technology is becoming a training need for psychiatry in general. Postgraduate exposure to brain imaging technology and to the neurosciences in general may be possible by attending workshops, postgraduate courses, and other training modules offered at conventions sponsored by professional organizations with an interest in promoting neuroscientific knowledge and clinically oriented neuroscientific training. As our knowledge of the neurobiological nature of psychiatric disorders becomes more extensive and increasingly sophisticated, its relevance for forensic psychiatry is also likely to grow.

Fiscal Accountability and Forensic Neuropsychiatry

As with other branches of medicine, limited resources and other economic constraints will continue to play a decisive role in the development of forensic neuropsychiatric practice. Although the question of financial limitations is appreciated by the law, neuroscience, and forensic psychiatry, it has yet to be clearly delineated. Also, it may well be that regardless of the current debate concerning the appropriateness of the use of neuroscientific knowledge in the law, diminishing cost of neuroscientific technologies such as functional brain imaging, may substantially increase their use in judicial settings. Despite these potential developments, the large fiscal burden generated by mental health care delivery in the United States and elsewhere in the world would always require fiscal accountability.

Given the currently high expense of neuroscientific technologies and the questions surrounding their admissibility in legal settings,[96] it is imperative that we incorporate evidence-based approaches in forensic neuropsychiatry. We can move toward this goal if potentially effective uses of neuroscientific technologies for forensic neuropsychiatry can be clarified and their effectiveness properly documented. Successful introduction of evidence-based psychiatric interventions in forensic neuropsychiatric practice will depend on the ability to document neuropsychiatric data systematically and the explicit reasoning that clarifies points of relevance to the law. Furthermore, this process must occur at both the level of the individual practitioner and the larger medical infrastructure, so that both derive benefit from the impressive database being generated by modern neuroscience and psychiatric science.

Although DSM-IV-TR has proven its value as a multifaceted tool that makes psychiatric diagnostics a reliable enterprise, formal inclusion of diagnostic criteria based on neuroscientific data of value is still in its early stages. Formalized inclusion of neuropsychiatric and developmental data of potential diagnostic and forensic psychiatric value must be intensively explored during the development of DSM-V, and such ongoing efforts should be shared with members of the psychiatric field. Although these efforts may not culminate in formal DSM-V axial categories, they could still form the basis for valuable textual components.

Evidence-based methodologies can be an appealing development for psychiatry, neuroscience, and the law if we consider that assessing the efficacy of forensic neuropsychiatric interventions will require careful use of data and rigorous documentation by those who become invested in professional accountability. However, evidence-based psychiatry should also transform forensic neuropsychiatric practice by encouraging the individual practitioner to organize data and assessment and by providing clearly documented psychiatric-legal reasoning. Furthermore, individual practitioners, medical psychiatric infrastructures, and components of the judicial system may benefit from collaborative efforts designed to streamline data collection and organization, a process that should facilitate further development of evidence-based interventions in forensic neuropsychiatry.

The Future of Forensic Neuropsychiatry

Philosopher Michel Foucault,[45] who made great contributions to the study of the relationship between psychiatry and the law in France, concluded that this relationship can be most effectively viewed as a complex web of competing and collaborative power relations in historical time, during which both psychiatry and the law were decisively affected. Similar developments occurred in the United States, where significant psychiatric participation in the criminal legal system has been recognized since the 19th century,[97] a trend that eventually culminated in the development of forensic psychiatry into a formal and robust field of professional endeavor.[98] Given these historical developments and ongoing neuroscientific progress, the demand for forensic neuropsychiatric expertise by the judicial system is likely to grow.

The history of forensic psychiatry reveals that the psychiatric domain has become an important aspect of criminal law, a characteristic that underscores the complex web of existing connections between psychiatry and the law. Equally important, a realistic understanding of the value that the law assigns to psychiatry must take into account the social infrastructure that currently encompasses both psychiatry and the law. This is an important point as we seek to understand how further development in modern forensic neuropsychiatry is likely to unfold. Since the relation between psychiatry and the law began long before the rise of modern neuroscience, it is a relationship that can serve only as a partial guideline for

future developments in forensic neuropsychiatry. The rest of the way must be built anew.

Both legal scholars and neuroscientists believe that current neuroscientific knowledge is not likely to bring about fundamental changes in current legal doctrine.[12,24] However, an increasingly influential perspective maintains that further advances in neuroscience will play a special role in clarifying fundamental questions such as those surrounding the nature of responsibility.[24,43] From this perspective, neuroscientific progress will make it increasingly untenable to pin responsibility on a concept of mind that functions more like a ghost in a magic black box, from which the ghost dispenses its truth to the faithful, a truth founded on overstated convictions about the nature of rationality and responsibility. It appears that this is also the same ghost that fails to acknowledge what to many people is already obvious—mainly that rationality and responsibility, like much of complex human behavior, is multicausally determined.

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