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IN THE DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT OF

THE STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

ERICK VIRGIL HALL, Petitioner, vs. THE STATE OF IDAHO, Respondent.	**Case No. SPOT0500155** **AFFIDAVIT OF HELEN MAYBERG M.D.**

BEING FIRST DULY SWORN your affiant declares as follows:

1. I am a physician specializing in neurology, neuropsychiatry and functional brain imaging. My education, training, and experience are summarized below. I have been retained by the Ada County Prosecutor's Office to address the appropriate uses and limitations of positron emission tomography (PET) and magnetic resonance imaging (MRI) in the diagnosis and assessment of neurological and psychiatric disorders. More specifically, I have been asked to address the issue of whether these brain scans provide

Exhibit A

scientifically reliable evidence that (1) establishes or confirms any specific neurological or psychiatric diagnosis in the defendant, or (2) confirms the contribution of brain damage to the defendant's behavior at the time of his purported crimes.

2. I received my medical degree from the University of Southern California and served as a resident in neurology at the Neurological Institute in New York, Columbia University College of Physicians and Surgeons in New York City. I am a board-certified neurologist. I completed a post-doctoral research fellowship in functional brain imaging in the Division of Nuclear Medicine at the Johns Hopkins School of Medicine in Baltimore, Maryland. Upon completion of my fellowship, I remained on the faculty of the Johns Hopkins School of Medicine in the Departments of Radiology/Nuclear Medicine, Neurology, and Psychiatry until 1991. In 1991, I was recruited to the Research Imaging Center and the Departments of Medicine (Neurology), Psychiatry, and Radiology at the University of Texas Health Science Center in San Antonio, where I worked until December of 1998. Between December of 1998 and December of 2003, I was Professor of Psychiatry and Medicine (Neurology) and the Sandra Rotman Chair in Neuropsychiatry at the Rotman Research Institute at the University of Toronto. I am currently a Professor of Psychiatry and Neurology at Emory University School of Medicine.

3. I have conducted research and published original research papers in the fields of neurology, neuropsychiatry, and neuroimaging. These publications are listed in my curriculum vitae, attached hereto as Exhibit A. I have been a standing committee member of grant review study sections at the National Institutes of Health, with specific responsibility for reviewing grants targeting the use of neuroimaging to study various neurological and psychiatric diseases. I am now or have served in the past on the editorial Boards of the following peer-reviewed journals: *NeuroImage, Human Brain Mapping, Biological Psychiatry, NeuroInformatics, Brain Structure and Function,Brain Imaging and Behavior, and Brain Stimulation.* In addition, I am an ad hoc reviewer for a number of other peer-reviewed journals, including: *Journal of Neuroscience, Nature, Nature Neuroscience, American Journal of Psychiatry, Archives of General Psychiatry, Biological Psychiatry, Journal of Neuropsychiatry and Clinical Neuroscience, Annals of*

Neurology, Neurology, Proceedings of the National Academy of Science, and Brain, among others. My academic responsibilities over the past 20 years have included: neuropsychiatric research using PET and MR imaging tools; clinical patient care duties related to the diagnosis and treatment of hospitalized and out-patient neurological patients; the teaching of clinical neurology to neurology and psychiatry residents, medical interns and medical students; and teaching and training in the use of PET and MRI to residents, medical students, post-doctoral fellows and faculty researchers. I have written extensively on the application of brain imaging technology, including numerous peer-reviewed articles and abstracts specifically focusing on PET and MR imaging. In addition, I served as Chairman of a Committee of the Brain Imaging Council of the Society of Nuclear Medicine which developed the position paper "Ethical Clinic Practice of Functional Brain Imaging" published in the *Journal of Nuclear Medicine* in June 1996. A copy of this position paper is attached hereto as Exhibit B and incorporated by reference.

4. In formulating my opinions in this case, I have reviewed the following materials relating to Mr. Hall:

a) FDG PET scans of Mr. Hall's brain from InterMountain Medical Imaging in Boise, dated 2/15/07 and provided on CD.

b) PET scan Report of Ian C. Davey, MD dated 2/21/07

c) MRI Scans: Xerox picture of 2 axial slices from the MRI study performed at InterMountain Medical Imaging in Boise on 2/21/07 attached to the MRI report generated by Vicken Garabedian MD (2/21/07)

d) First, Second and Third Affidavits of James Merikangas MD

5. I was not provided with either films or digital images of the MRI study or medical or jail records of the defendant in and around the PET/MRI exams to establish if Mr. Hall was taking any medications at the time of the imaging studies. No toxicology

screen is described in the PET scan report documenting absence of illicit or prescribed drugs in his system at the time of the PET study.

6. I did not review past medical or psychiatric records or expert examinations of the defendant or details of his past trials or convictions. The prosecution has informed me that the murder under discussion occurred in September of 2000, more than 6-and-a-half years prior to the PET and MRI scans. I have further been informed that testimony showed that Mr. Hall used intravenous methamphetamine in 2001 and 2002, and alcohol in 2003. Such drug and alcohol abuse is also described in Dr. Merikangas' affidavit, including the use of cocaine. As Mr. Hall has been incarcerated since 2003, it is assumed that he has not used either since his arrest. As stated above, no toxicology screen was reported at the time of the PET documenting absence of illicit or prescribed drugs in his system.

7. My opinions below are based upon my training, experience, and review of the published medical and scientific literature and are consistent with the statements published by the Brain Imaging Council of the Society of Nuclear Medicine in 1996, the Academy of Neurology in 1991, and the American College of Radiology in 2002 (and revised in 2006), copies of which are attached hereto as Exhibit C and incorporated by reference. Updates on these articles have not been published because the degree of general acceptance of PET has not substantially changed.

8. Positron Emission Tomography (PET), also referred to as a PET scan, is an imaging procedure used to study brain function. PET scanning involves the injection of a radioactive chemical into the body, which is taken up by various organs, including the brain, and then measured using specialized sensors. Using different chemicals, various aspects of brain physiology can be assessed. PET using F18-fluorodeoxyglucose (FDG) provides information about cellular energy metabolism, which is an index of regional brain function. This technique provides complementary, but different information from that obtained using x-ray computed tomography (CT) or magnetic resonance imaging (MRI), which identify structural features of the brain.

9. The use of PET for the clinical diagnosis and treatment of individual patients is extremely limited. Generally recognized and accepted uses of FDG PET scans include the evaluation of EEG-proven temporal lobe epilepsy (for the purpose of lesion lateralization prior to surgery), brain tumors (tumor grading and to differentiate radiation necrosis from tumor recurrence), and in the differential diagnosis of dementia (Alzheimer's disease versus vascular dementia versus fronto-temporal dementia). PET scans are not used as a general brain screening test.

10. PET is not a generally recognized test for diagnosing residual effects of past traumatic brain injury. To date, there are no prospective, replicated studies demonstrating consistent and reliable patterns that correlate with either the presence of a past injury or specific neurological, psychiatric, or neuropsychological sequel of injury. The error rate (sensitivity and specificity) of the test for this diagnosis is not known. As such, these scans cannot be used for diagnostic purposes, to predict long-term outcome or to quantify the degree of disability.

11. Furthermore, and contrary to Dr. Merikangas' claims, oxygen deprivation, high fevers, infections or measles, are also not recognized differential diagnoses of bilateral temporal metabolic abnormalities on FDG PET. PET scans also have no utility in the diagnosis of congenital brain abnormalities resulting from fetal exposure to alcohol or brain damage due to past repeated use of alcohol, cocaine and/or methamphetamine.

12. In general, in order for PET or any medical procedure to provide a scientifically reliable means to diagnose a specific medical condition, scan abnormalities must first be identified and statistically confirmed in groups of patients with that condition verified using independent clinical and pathological criteria. A scientifically valid correlation must then be shown between the scan patterns and the independent clinical/pathological criteria before the significance of specific abnormalities can be attributed to a specific disease or condition. Lastly, group patterns must be shown to be reliably detectable in individual subjects, including a determination of sensitivity and specificity (to determine error rate, false positives and false negatives). In general, in order for a test to evolve from a research observation to an accepted clinical procedure that can be used in

individual patients, results of these various steps must be peer-reviewed, published and replicated. None of these steps has occurred with respect to the use of PET to diagnose any of the conditions opinioned in Dr. Merikangas' affidavit.

13. Dr. Davey who read the PET scan at InterMountain Medical Imaging, reported decreased activity in the medial temporal lobes and temporal poles bilaterally. He offered no differential diagnosis for these findings, concluding they were nonspecific. His findings and conclusions were based solely on a subjective clinical reading of the PET scan pictures which cannot be confirmed in the absence of normative data from healthy controls of comparable age and gender to Mr. Hall scanned under comparable conditions on the same scanner. No such quantitative comparisons were performed to determine if Mr. Hall's scan is in fact statistically and significantly different from the normal variations in scans of healthy subjects. This is the only way to validate if in fact the scans are even abnormal. This is also the necessary first step before making any attempts to offer a differential diagnosis based on published scan patterns of known neurological conditions.

14. Even if the reported bilateral medial and anterior temporal lobe findings are assumed to be true abnormalities, they are not diagnostic of any specific neurological, psychiatric condition as opined by Dr. Merikangas. Furthermore, conclusions suggesting a causal link between the PET findings and aggressive impulsive behavior, poor executive functioning, poor judgment and low intelligence are without scientific basis as is the attempt to link such scan findings identified on 2/15/07 to Mr. Hall's criminal activity many years prior.

15. The MRI scans also reported some nonspecific findings, namely mild prominence of the ventricles without cortical atrophy (upper limits of normal) and a few tiny foci of white matter hyperintensities on the T2 images (also upper limits of normal). These findings are not diagnostic of any specific neurological or psychiatric disorder and Dr. Garabedian, the radiologist of record, offered no differential diagnosis, concluding the study was normal. Nonetheless, Dr. Merikangas opined otherwise concluding significant damage to the white matter and significant cortical atrophy likely due to

multiple traumatic brain injuries. Despite no mention of an abnormal corpus callosum in the Radiologist's report, Dr. Merikangas further concluded that the corpus callosum was abnormally thin and narrow consistent with fetal alcohol spectrum disorder.

16. As with the PET scans, no quantitative measurements of either brain volume (to quantify cortical atrophy) or corpus callosum thickness, shape or volume have been provided to confirm such claims. No statistical comparison between the defendant's scan and scans from healthy control subjects of like age and gender have been performed to confirm that white matter hyperintensities, cortical atrophy and corpus callosum thickness deviates from normative limits. In the absence of confirmation of true abnormalities, cause and effect links of these scan findings to specific behavioral abnormalities in the defendant are not scientifically supportable.

17. To summarize, there are no established structural or functional neuroimaging scan patterns diagnostic of any of the congenital, developmental, neurological or psychiatric disorders/syndromes considered contributory by Dr. Merikangas. Neither are there reliable scan patterns that correlate with impulse control and aggressive behavior that might explain his criminal activity. The reported PET and MRI scan findings are at best, non-specific and do not conform to any published research or clinical conditions. In the absence of age and gender match control subjects and quantitative comparisons of Mr. Hall's scans to such control groups, the PET and MRI findings cannot even be confirmed as abnormal and more likely reflect normal variations.

18. With the information currently available, there is no scientific basis to conclude that the MRI or PET scans provide objective evidence of a biologically based brain disease responsible for the defendant's behavior as an infant, child, adolescent or adult or specifically, at the time of the crimes for which he has been accused. Furthermore, any conclusions based on these scan findings that the defendant suffers from a brain based defect of mind and reason that renders him substantially incapable of (1) conforming his conduct to the requirement of law or (2) appreciating the wrongfulness of his conduct are also scientifically unsupportable.

I reserve the right to modify these opinions in light of additional information that may be forthcoming and to amend this report in light of such new information.

Further your affiant sayeth not.

DATED this 19 day of December, 2007.

Helen Mayberg, M.D.

STATE OF Georgia)
) ss.
County of DeKalb)

On this 19 day of December 2007, before me, a Notary Public, appeared **Helen Mayberg, M.D.**, known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that he executed the same.

Linda H Donoff

Notary Public for the State of Georgia
Residing at: 5805 Carlton Way Stone Mtn GA 30087
My Commission Expires: 8-5-2009

CERTIFICATE OF MAILING

I HEREBY CERTIFY that a true and correct copy of the foregoing document was delivered to State Appellate Public Defender, 3647 Lake Harbor Lane, Boise, Idaho 83703 through the United States Mail, this 21 day of Dec 2007.