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THE POST-FREUDIAN CASEBOOK NEURONOVEL

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THE POST-FREUDIAN CASEBOOK NEURONOVEL

By

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THESIS

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ABSTRACT

THE POST-FREUDIAN CASEBOOK NEURONOVEL

By

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This thesis focuses on postmodern American fiction, specifically defining a sub-genre of postmodernism that has been developing since at least the 1990s: the Post-Freudian Casebook Neuronovel. The post-Freudian casebook neuronovel is an offshoot of the psychological novel, which draws on postmodern techniques that emphasize the erosion of absolutes while simultaneously (and in an apparent contradiction) referencing neuroscience's absolutist explanations. This sub-genre is filled with both biological and psychological problems that pervade characters' lives. Specifically, this thesis discusses Don DeLillo's *White Noise*, Richard Powers' *The Echo Maker*, and Jonathan Lethem's *Motherless Brooklyn*.

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Introduction: The Development of a New Genre

This thesis follows the format prescribed by the *MLA Style Manual* and the Department of English.

The Post-Freudian Casebook Neuronovel is a sub-genre of the contemporary novel that features characters with brain disorders, and that uses scientific language to bridge the gap between scientific knowledge and human experience in a postmodern world. Presently, our world is dominated and defined by an outpouring of technological advancements and developments. This explosion in technology has allowed scientists to discover more about the world than ever before. However, although there have been more breakthroughs in understanding of such complex subjects as the universe over the last twenty years, scientists have barely scratched the surface of that thing most intimate and essential to life: the brain. This gray, wrinkled, 3 pound mass of tissue, neurons, axons, and synaptic connections controls our every thought, wish, dream, desire, and movement. It determines our perceptions and our understanding of reality, yet we still know almost nothing of how it works. Because of this increased interest in all things brain-related, a new genre is on the rise – the Post-Freudian Casebook Neuronovel.

The origins of this neuroscientifically-informed genre lie in the age of depth psychology with the case studies of Sigmund Freud, who pioneered the turn from traditional, scientific and prescriptive case studies to the psychonarrative, which took patients out of the laboratory and instead studied them in a different, more personal light. In his book *Studies on Hysteria*, published in 1895, Freud comments on what he saw as an inevitable overlap between diagnosis and storytelling:

I have not always been a psychotherapist. Like other neuropathologists, I was trained to employ local diagnoses and electroprognosis, and it still strikes me as strange that the case histories I write should read like short stories and that, as one might say, they lack the serious stamp of science. I must console myself with the reflection that the nature of the subject is evidently responsible for this, rather than any preference of my own. The fact is that local diagnosis and electrical reactions lead nowhere in the study of hysteria, whereas a detailed description of mental processes such as we are accustomed to find in the works of imaginative writers enables me, with the use of a few psychological formulas, to obtain at least some kind of insight into the course of that affection. Case histories of this kind are intended to be judged like psychiatric ones; they have, however, one advantage over the latter, namely an intimate connection between the story of the patient's sufferings and the symptoms of his illness. (160)

By writing about his patients as people with stories, not as a series of symptoms and disorders, Freud took the sterility out of case studies and brought out a distinctly humanist dimension that was not previously considered.

In subsequent years, scientists caught on to Freud's new way of writing about disorders. For instance, neuropsychologist A. R. Luria bridged the gap between psychology and neurology by studying the effect the physical brain had on areas such as personality, emotions, and memory. Luria then turned his case studies into stories about the people he was observing, casting aside classic scientific case studies of the past as exhibited by his book *The Mind of a Mnemonist: A Little Book About a Vast Memory*

(1987), which tells the story of a man with limitless memory.¹ His work in turn influenced other neurologists, such as Oliver Sacks, who has published multiple works in the neuronarrative genre. Sigmund Freud also inspired V. S. Ramachandran, one of today's leading neurologists. Ramachandran has done extensive studies on disorders such as phantom limb, synesthesia, and Capgras syndrome.

As the neuronarrative evolved and gained popularity, there was also an increasing interest in and awareness of the human brain, two events which are intimately linked. On July 17, 1990, President George Bush issued a proclamation, announcing the 1990s to be the "Decade of the Brain." This initiative was "to enhance public awareness of the benefits to be derived from brain research" through "appropriate programs, ceremonies, and activities" (*Project*). Bush's program reflected the growing need to study the brain due to an increased number of brain-related disorders, such as Alzheimer's, schizophrenia, and autism, as well as a push in the scientific community to gain more understanding of the complex inner-workings of the brain, the which controls our every thought, wish, dream, desire, and movement. It determines our perceptions and our understanding of reality, yet we still know almost nothing of how it works. This pressing need to understand the brain and how it works, combined with governmental support, heightened the importance and value of the neuronarrative.

Consequently, with the evolution of the neuronarrative came the emergence of the neuronovel. Over the period that the neuronarrative developed, postmodern novelists

¹ This study done by A. R. Luria focused on a man, named *S.*, who appeared to have a limitless memory. His ability to recall so many things, and from such a large time span, led Luria to believe the reason his memory was so vast was partly caused by his synesthesia, the ability to see sound, to taste sound, or to hear color (27). This book was groundbreaking when it was released because, as the introduction to the book notes, "For almost thirty years the author had an opportunity systematically to observe a man whose remarkable memory was one of the keenest the literature on the subject has ever described" (3).

have taken notice of the trend and have become interested. Jay Clayton, professor and literary critic of genetic literature, comments, “there has been a ‘veritable explosion’ in the last twenty years of ‘fictional explorations of scientific issues’” (qtd. in Johnson 173). These “fictional explorations of scientific issues” are the meeting of science and literature; in these novels, authors have taken the absolutist, technical language of neuroscience and fused it with the unfixed world and techniques of postmodern fiction. In an article published in *n+1*, Marco Roth explains, “What has been variously referred to as the novel of consciousness or the psychological or confessional novel – the novel, at any rate, about the workings of a mind – has transformed itself into the neurological novel, wherein the mind becomes the brain.” Authors of the neuronovel, such as Don DeLillo, Richard Powers, Jonathan Lethem, Ian McEwan, Mark Haddon, Nicole Krauss and Rivka Galchen, zero in on specific psychological and physiological brain disorders and use the language of the sciences to bridge the gap between science and experience.²

By using brain research in their novels, postmodern fiction authors question existence in a postmodern world via the juxtaposition of the concrete, fact-based language of science and the plastic, impressionable language of fiction. Traditionally, postmodern authors have used the language of fiction to convey the meaninglessness in life, its chaos, and its unpredictability. Regarding the skeptical view of postmodern writing, Stephen Best and Douglas Kellner write:

² Although the neuronovel is not well-known, Gary Johnson, in his article “Consciousness as Content: Neuronarratives and the Redemption of Fiction,” takes note of the rising subgenre, stating, “...a growing list of narrative works, including Powers’s recent *The Echo Maker*, Ian McEwan’s *Saturday*, Jonathan Franzen’s *The Corrections*, and A.S. Byatt’s *A Whistling Woman*, follows suit in foregrounding the emerging fields of neuroscience and neurobiology. These works, I propose, constitute an emerging subgenre of literature that can provide us with a glimpse of how authors are responding to scientific advances concerning the nature of human consciousness” (170).

Where modernist novels still assumed some order and coherence in the world and, despite moral uncertainties, aspired to project schemes of redemptive vision, postmodern fiction took a more nihilistic stance in portraying the random indeterminacy of events and meaningless actions, projecting an epistemological skepticism later articulated in postmodern theory. (131)

The postmodern world was dystopian, dominated by the media and lacking metaphysical meaning. Neuronovelists, however, attempt to create order by connecting the randomness of postmodernism to the authoritative language of neuroscience. But by trying to connect what it feels like to be a person with a malfunctioning brain through scientific terminology, these authors inherently run into the problem of the explanatory gap, a concept Thomas Nagel proposes in his article, "What Is It Like to Be a Bat?" In his article, Nagel explains his hypothesis.

Every reductionist has his favorite analogy from modern science. It is most unlikely that any of these unrelated examples of successful reduction will shed light on the relation of mind to brain. But philosophers share the general human weakness for explanations of what is incomprehensible in terms suited for what is familiar and well understood, though entirely different. This has led to the acceptance of implausible accounts of the mental largely because they would permit familiar kinds of reduction....The most important and characteristic feature of conscious mental phenomena is very poorly understood. Most reductionist theories

do not even try to explain it. And careful examination will show that no currently available concept of reduction is applicable to it. (435)

And so, following Nagel's argument, postmodern authors who use scientific language to write about disorders like Capgras or Tourette's, for example, face the predicament of bridging the explanatory gap. While authors try to communicate what it would be like to have a brain disorder through reductionist scientific language, they have to balance their technical description with a traditional convincing portrait of a character to provide what Nagel calls "the subjective character of experience," which is missing from most reductionist neuroscientific accounts of the mind (436). For example, if an author wants to write about a character with elevated levels of dopamine, as well as a lateral frontal lobe lesion, pure scientific terminology could help readers could understand biologically what is happening to the character, but could not understand his experience because the scientific language does not relate directly to our own subjective experiences. Authors must address the question of "What, exactly, do scientific terms *mean* in relation to our intimate experience of consciousness?" In her novel *Man Walks Into a Room*, Nicole Krauss dramatizes this problem through her character Anna, who tries to understand her husband's brain injury:

It was with great difficulty that she registered the words of Dr. Tanner, who was sitting across from her now. It's about the size of a cherry, pressing on the temporal lobe of his brain, most likely a juvenile pilocytic astrocytoma. And in her own mind—clear, unthreatened by disease—Anna imagined the shiny dark red of a cherry nestled into the gray matter of the brain. (13)

Here, when confronted by neuroscientific language, Anne attempts to understand the terms described to her by her doctor. By relating the scientific language to something as common in experience as a cherry, Krauss illustrates the gap that exists between specialized scientific terminology and the experience of consciousness. This attempt to dramatize and grapple with Nagel's gap is not limited to Krauss' work – authors of the neuronovel try to close the explanatory gap by simultaneously incorporating scientific language and describing the subjective viewpoints of characters.

The Triune Brain

Among the theories of the brain, one in particular recognizes three different hierarchical areas of the brain, the Triune Brain hypothesis. The theory of the triune brain was proposed in the 1960s by Paul MacLean, an American physician and neuroscientist. Then, in 1990, he published his book, *The Triune Brain in Evolution: Role in Paleocerebral Functions*, which contains a detailed explanation of his brain hypothesis. In his account, MacLean asserts that people house three separate, though intricately connected brains: the proto-reptilian brain (or R-complex), the paleomammalian brain, and the neomammalian brain, each of which is representative of a stage in the evolutionary process.

The proto-reptilian brain is the innermost and oldest of the three brains. This region is comprised of the R-complex, which contains the brain stem and cerebellum. It is responsible for “innate, stereotyped, species-typical behavioral patterns necessary for survival of self and species” (Gould 1). The proto-reptilian brain is named such because the brains of reptiles are dominated by the brain stem and cerebellum, which affirms its place as the most basal and primal of the three brains. Enclosing the proto-reptilian brain is the paleomammalian brain, which is composed of the limbic system. This limbic system controls emotional and instinctual impulses. It is the seat of responses like fear, anger, and pleasure and is reminiscent of early mammals. Lastly, MacLean named the outermost, most complex of the brain’s three areas, the neomammalian brain. The neomammalian brain consists of the neocortex, as well as the thalamic structures. This is the region that dictates consciousness, language, reasoning, and analytical thinking (Gould 1-3).

In MacLean's hypothesis, the three hierarchical sections of the brain communicate with one another, accounting for normal brain function. When the signals between the three brains become disrupted or blocked by hyperactivity or a misfire of synapses, however, a "temporary occurrence of neuro-communication breakdown," or, in more severe cases, pathological behavior could result (Gould 3). In his essay "Don DeLillo's *Great Jones Street* and the Science of Mind," Stephen Burn notes,

...humanity is forever involved in an interior battle against its neuropsychological divisions, split between the rational dictates of the cortex and the emotional responses of the reptilian and old mammalian brains. This "schizophysiology," as MacLean later told an interviewer, means that we "look at ourselves and the world through the eyes of three quite different mentalities," but only one of these has the power of speech. (qtd. in Sagan 55)

The idea that the brains are constantly struggling with one another due to their divisions, and that only one brain has the ability to communicate its mentality through speech is a reference back to the power of language in describing experience. This fusion of MacLean's brains and language has since been adopted and used in various ways by postmodern authors interested in the neuronovel. The triune brain theory is a way for these authors to narrow the breach between the subjective experiences they are writing about and the scientific language of neuroscience.

DeLillo's Triune Brain in *White Noise*

Don DeLillo, arguably one of the most influential postmodern authors,³ is no stranger to the neuronovel. In fact, from the earliest, his work has been considered in terms of science. The first book dedicated solely to Don DeLillo was Tom LeClair's *In the Loop: Don DeLillo and the Systems Novel* (1988). Among other things, LeClair considers DeLillo in terms of the scientific approach known as systems theory. Other critics have noticed DeLillo's affinity to science, too. For example, in his article "Don DeLillo's *Great Jones Street* and the Science of Mind," Stephen Burn notes:

Among novelists, Don DeLillo has been especially sensitive to the way science has redefined the concrete realities of contemporary life. As scientists named their newly-discovered world, DeLillo explained to Tom LeClair that he had found in science "a new language to draw from." But while DeLillo discovered "a source of new names" in scientific language, beyond new nouns he also found a new understanding of the neurophysiological basis of the self as science remapped "connections between people and the world." (347)

This interest in science as a way to map connections between people and the world, however, does not surface exclusively in his *Great Jones Street*. Moreover, DeLillo's interests do not extend solely to the broad field of science; the "neuropsychological basis of the self," as referenced in Burn, indicates DeLillo's interest not only in science but particularly in brain science.

³ In his book *Don DeLillo: The Physics of Language* (2002), David Cowart resonates the idea that DeLillo is highly influential: "In his acute rendering of the bi-millennial moment, Don DeLillo ranks among the most important of contemporary authors" (1).

An example of DeLillo's interest in science surfaces in Tom LeClair's classic study, *In the Loop* (1987). Here, LeClair discusses DeLillo's novel *The Names* in terms of split-brain research. In fact, this use of neuroscience surfaces elsewhere in DeLillo's work, such as in his novel *Ratner's Star*, where he seems to explicitly summarize MacLean's theory:

As now constituted [the brain] can be viewed in cross-section as a model for examining the relative depths of protohistoric and modern terror. Cycles and swamp terrains of fear and periodically recurring depressions and earliest wetland secretions of dread (brain stem and midbrain), not to mention Mr. Mammal as paranoid grandee of the grassy plains, that (limbic) region of emotional disorganization, falling sickness, psychosomatic choking...leaving us, he thought, with the geometry, music, and poetry of our evolved, cross referencing and highly specialized outer layer of gray tissue (cerebral cortex). (381)

Here, DeLillo shows his interest in science, and specifically, his knowledge of MacLean's triune brain theory. However, while some of his work has been considered in terms of brain research, to date, no one has yet discussed *White Noise* in terms of brain research. Specifically, in *White Noise*, DeLillo uses Paul MacLean's triune brain theory as a way to connect people and their world in his 1985 novel *White Noise*. Here, DeLillo dramatizes MacLean's triune brain theory through the children in the Gladney family: Wilder, Steffie, Denise, and Heinrich, and, notably, the gradual growth of the children in age is a parallel to the Darwinian process of evolution so important to the triune brain theory, their separate ages signing the separate levels of the brain. Finally, in the fashion

of a case study, Jack is the first-person focus, and the characterization of the triune brain serves as an index against which readers can measure his psychological state.

The lowest, inner-most level of MacLean's model is the proto-reptilian brain, which represents the most primal of the evolutionary states, and is only capable of those primary physical functions necessary for survival. It is this brain that Wilder Gladney represents. Only two years old, Wilder is the youngest of the Gladney children. But, even at six, Wilder is underdeveloped for a child of his age. Like the reptile, Wilder, too, is without language. The first time readers hear any sound from him, it is crying. It is a crying spell with no explanation, and it lasts for seven hours. "It was a rhythmic crying, a measured statement of short urgent pulses. At times it seemed he would break off into a whimper, an animal complaint, irregular and exhausted, but the rhythm held, the heightened beat, the washed pink sorrow in his face" (*WN* 75). These animal-like emissions are Wilder's way of dealing with the world, his own sort of interface, because he does not have the more advanced methods of processing of information and communication possessed by the other two, higher-level brains.

In another parallel to reptilian behavioral characteristics and thus implicitly to the proto-reptilian brain, Wilder is prone to repetitious mannerisms, and does not seem to adjust his behavior according to past experiences. Instead of basing his behavior upon learned experience, he is only capable of following the most fundamental instincts. Throughout the novel, Wilder is often lost, or is simply standing around, blankly watching the scenes that unfold before him. "Wilder, who had wandered downstairs to sit on the floor and stare through the oven window" (27); "Wilder was in there watching Heinrich do a physics experiment with steel balls and a salad bowl" (30); "The small

child moved in a swaying gait, great head wagging” (34). Additionally, he never shows any interest in participating in the events that surround the family, and readers rarely see him interact with his environment. “The table was crowded and Babette and Denise elbowed each other twice, although neither spoke. Wilder was still seated on the counter surrounded by open cartons, crumpled tin-foil, shiny bags of potato chips, bowls of pasty substances covered with plastic wrap, flip-top rings and twist ties, individually wrapped slices of orange cheese” (*WN* 7). In this scene, as the family gathers around the table to talk, Wilder is forgotten on the kitchen counter amidst the clutter, and is perfectly content to be forgotten. He never judges or gives any indication that he understands what is going on. Blending in with his environment, Wilder is a chameleon, an uninterested presence who seems to be operating in his own private, primitive world.

Although his character is incapable of language and appears to be too simple for any sort of advanced thought, Wilder nevertheless seems to represent the possibility of the proto-reptilian brain. DeLillo notes, for example, that “Behind that dopey countenance, a complex intelligence operated” (78). He is a bridge between the dark, nonverbal world of the old, proto-reptilian brain, and the world of language in the paleomammalian brain. Although he is still in the nonverbal stage, episodes demonstrating the possibility for language represent the evolution of the brain, the gradual building of complex systems and functions. Here, Wilder exhibits his attempt at language: “Only Wilder remained calm. He watched his mother, spoke to her in half-words, sensible-sounding fragments that were mainly fabricated” (103). This apparent desire for and attempt at language hints at MacLean’s Darwinian construction of the brain.

Moving past the proto-reptilian brain, the next level in MacLean's model is the paleomammalian brain. The paleomammalian brain is in the middle, sandwiched between the most advanced and the least developed brains. It is in this section that emotions, perceptions of reality, and instincts are generated and maintained. Governed by her feelings, seven year-old Steffie represents this brain, and more specifically the emotional governance of the limbic system. Throughout the novel, she is known for her extreme emotionality, and especially for her reactions to outward events. Early in the novel, for instance, "Steffie became upset every time something shameful or humiliating seemed about to happen to someone on the screen. She had a vast capacity for being embarrassed on other people's behalf" (WN 16). In yet another example of Steffie's affectability, she reacts emotionally to her external situation: "In the meantime the mask, setting off her eyes, dramatized [Steffie's] sensitivity to episodes of stress and alarm" (WN 154). These external interactions, whether a television show or a stressful situation, cause intense emotional reactions in Steffie, demonstrating the effects of the emotional amygdala, one of the main components of the limbic system.

Due to her dependence on her emotional capacity, Steffie predominantly uses her feelings to make sense of the world. Through her emotions she configures her perceptions, and as most perceptions are generated through sight, it is only natural that in *White Noise* Steffie's eyes are constantly referenced. Her eyes are a way to understand her emotional state. "Steffie retreated with the phone, appearing to shield it with her body, her eyes full of fear and excitement" (WN 43); "Steffie managed to get our attention by the sheer pleading force of the look on her face" (WN 42). In addition to showing her own emotional state, Steffie's eyes are also interpreters for the feelings of

her family members. “Her face in pouchy sleep might have been a structure designed solely to protect the eyes, those great, large and apprehensive things, prone to color phases and a darting alertness, to a perception of distress in others” (WN 148). Not only does Steffie reflect the intense concern, excitement, and fear her family feels throughout the novel, but she also uses her empathetic understanding to help make her family feel better by physically comforting them:⁴

Steffie was holding my hand in a way I’d come to realize, over a period of time, was not meant to be gently possessive, as I’d thought at first, but reassuring. I was a little astonished. A firm grip that would help me restore confidence in myself, keep me from becoming resigned to whatever melancholy moods she thought she detected hovering about my person.

(39)

This compassion Steffie exhibits is a result of the hypothalamus’ overriding influence from the paleomammalian brain.

Surrounding the paleomammalian brain is the neomammalian brain, the most complex and advanced of MacLean’s model. This brain is governed by the neocortex, which is responsible for higher-level analytical thought, the possibility for language, as well as conscious perception. Here, two of the Gladney children represent different functions of this part of MacLean’s brain: Denise and Heinrich. Denise, eleven years-old, is representative of the neocortex’s consciousness and language functions. As the family’s guardian, she is a reliable rock who is able to see past the surface of things and into the motives and thoughts of the members of her family; she is “a pint-sized

⁴ Here, Steffie comforts her father as they shop in the supermarket: “Steffie took my hand and we walked past the fruit bins” (DeLillo 36).

commissar, nagging us to higher conscious” (WN 94). She is not easily misled and knows, never guesses. “She paused, conceding the possibility that if Denise is the source of a rumor or theory, it could very well be true” (WN 52). Like references to Steffie, mention of Denise includes allusion to her eyes⁵, although in a different context. She is always perceiving her surroundings, quietly “looking,” “watching,” or “eyeing” the people and situations in the story. By perceiving the situations around her, Denise is the person who always gives her family a reality check and doesn’t allow her emotions to cloud her judgments. “Denise had put down her reference work and was giving me a hard-eyed look. It was the look she usually saved for her father and his latest loss of foothold” (WN 133). Denise’s ability to use her brain to logically work through her perceptions without being tainted by emotional influences demonstrates the neocortex’s sophisticated inner workings.

Just as Denise is representative of the neomammalian brain, so, too is Heinrich. As the most logical and academic of all of the children, Heinrich exhibits the neocortex’s language function and especially its higher-level analytical thought abilities. The eldest of the children at fourteen years-old, Heinrich is withdrawn and quiet. He leaps at every opportunity to argue with his father, Jack, especially about scientific and epistemological issues. While Denise demonstrates the usual, practical functions of the neocortex, Heinrich shows the most highly complex function of the human brain, the metacognitive ability to question truth and reality. Here, Heinrich’s sentiments show a sort of predictive ability in DeLillo as they prophesize those of Francis Crick’s “astonishing hypothesis.”

The Astonishing Hypothesis is a study published in 1994, which explains “the idea that

⁵ Here are two additional references from the novel to Denise’s facial expressions: “The eleven-year-old face was an expert mask of strained exasperation” (41); “Denise said, the face carefully emptying itself of expression” (42).

our thoughts, sensations, joys and aches consist entirely of physiological activity in the tissues of the brain” (Pinker 3). This visionary concept in *White Noise* showcases just how close DeLillo is to neuroscientific research. In a scene involving Heinrich and Jack, Heinrich asks his father, “Who knows what anyone wants to do? How can you be sure about something like that? Isn’t it all a question of brain chemistry, signals going back and forth, electrical energy in the cortex? How do you know whether something is really what you want to do or just some kind of nerve impulse in the brain?” (WN 45). His constant questioning of the world around him confirms Heinrich’s role as a model for MacLean’s neomammalian brain.

Heinrich’s constant questioning of the world around him also demonstrates the futility of abstract cognition if it is not nourished by the senses. In the novel, as Jack drives Heinrich to school, the two begin talking about the radio forecasting rain for the evening, even though it is raining as they speak. Jack argues, “Just because it’s on the radio doesn’t mean we have to suspend belief of our senses” (WN 23). Jack’s comment sends Heinrich into an epistemological tirade. “Our senses? Our senses are wrong a lot more often than they’re right. This has been proved in the laboratory. Don’t you know about all those theorems that say nothing is what it seems? There’s no past, present or future outside our own mind. The so-called laws of motion are a big hoax. Even sound can trick the mind” (WN 23). Even though Heinrich is representative of the highest, most complex function of the mind, this example is an illustration of what happens when the three parts of the brain do not work dependently. The embodiments of the triune brain in *White Noise* all function separately – they do not work in tandem as they are supposed to for the most effective cognitive operation. Therefore, although Heinrich is capable of

producing the most complex and abstract thoughts, his ideas are being wasted because they are not being nurtured by his senses.

Together, the Gladney children represent the vast cerebral functions of the triune brain. This, combined with the steady growth of the children as Darwinian theory dictates, collectively serves as a psychological index against which readers can measure and gauge the psychological state of Jack. Following in the tradition of a case study, Jack is the first-person focus of this study of the postmodern man living in a postmodern world. Being a postmodern man, Jack has difficulty relating to the world around him, physically, emotionally, and intellectually. It is through the vectors of his children that Jack interacts with the world. Depending on his psychological state, he naturally gravitates toward the child who most closely represents the way he is feeling at that point in time.

For instance, when Jack needs physical and emotional comfort, he goes to Steffie; after a computer technician tells Jack he has been exposed to Nyodene, informing him that death is inside of him, he goes to Steffie for some sort of emotional relief at the news of his own death. “In my current state, bearing the death impression of the Nyodene cloud, I was ready to search anywhere for signs and hints, intimations of odd comfort. I pulled my chair up closer [to Steffie]” (*WN* 148). When Jack needs reassurance and practical advice, he goes to Denise; when Jack finds a bottle of his wife’s Dylar, he goes to Denise for advice on what to do. “I went at once to find Denise. She was in bed watching TV. When I told her what I’d found we went quietly into the bathroom and looked at the bottle together” (*WN* 170). When he get too wrapped up in the complexities of life and needs to come back down to earth, he depends on Steffie and Wilder to remind

him of simpler times; “I got out of bed in the middle of the night and went to the small room at the end of the hall to watch Steffie and Wilder sleep. I remained at this task, motionless, for nearly an hour, feeling refreshed and expanded in unnameable ways” (WN 174). The children make it easier for Jack to understand the complex world around him as it is through the children that he comes to his own conclusions about the situations that surround him throughout *White Noise*.

Capgras and the Triune Brain in Richard Powers' *The Echo Maker*

Like DeLillo, Richard Powers is another author who has shown great awareness of science in his writing. In fact, during an interview with Stephen Burn, he cites noted neuroscientists A.R. Luria, Roger Sperry, Michael Gazzaniga, Antonio Damasio, Gerald Edelman, V.S. Ramachandran, and Joseph LeDoux as great interests and influences upon his work. In another interesting parallel to DeLillo, the latest edition of *White Noise*, released by Penguin Classics in 2009, contains an introduction written by Richard Powers.⁶ And, like *White Noise*, *The Echo Maker* features the triune brain. While in *White Noise* the triune brain is used as a frame against which readers measure the main protagonist's psychological state of mind, in *The Echo Maker*, Richard Powers employs the theory as a narrative framing device. However, instead of using it as a way to frame a character, he uses it to frame an overarching theme in his work. In Powers' work, there is a constant and overriding motif of connectedness. One way he illustrates this motif of connectedness is through the personification of the triune brain in the characters Mark, Karin, and Gerald Weber. He openly acknowledges the influence on of the triune brain on his novel: "...you could think of this trio of central protagonists as a little bit like MacLean's triune brain – one part reptilian, one part limbic, one part cerebral, and all parts improvised, interdependent, perpetually revised, and mutually self-deluding" (Powers Burn Interview 178). In addition to the use of MacLean's model, Powers also uses the physiological brain disorder Capgras delusion, as well as the constant reference to cranes to showcase the disconnect between mind and nature. More importantly, he demonstrates the fundamental core philosophy that although life and the world seem to

⁶ Additionally, Tom LeClair, author of *In the Loop*, also published "The Prodigious Fiction of Richard Powers, William Vollmann and David Foster Wallace" in 1996, one of the first academic articles written about Powers' fiction (Hermanson).

be random, the reality is that everything is connected through the long history of evolution, in the shape of the shadow of an inescapable past present in all our brains. This novel is a case study not only of a patient with Capgras, but also of the complexity and interconnectedness of life.

Capgras delusion, one of the novel's two main symbolic motifs, manifests itself in the character Mark who, after getting into a terrible car accident, suffers head trauma and develops Capgras delusion. As a result of this particular head trauma, "brain damage has disrupted the connections in the patient's brain between the face recognition system and the autonomic nervous system" (Davies 140). Biological research suggests that we register and recognize faces both consciously and at a more unconscious, subcortical level. In the case of Capgras syndrome, patients are able to consciously recognize people and objects through their sight and hearing, but for people with whom the patient has considerable emotional ties, the unconscious recognition malfunctions; the actual emotional response to such familiarities does not match up to the brain's expected response, which therefore leads the patient to believe the mother, brother, spouse, pet, or home is not the real one, but instead has been replaced by an impostor. The brain's ability to trick itself into believing in its own mental construct showcases itself especially well in Capgras.

Steven Pinker, Professor of Psychology at Harvard and author of *How the Mind Works*, echoes this idea in his article "The Mystery of Consciousness." He notes that in such cases, "A patient who fails to experience a visceral click of recognition when he sees his wife but who acknowledges that she looks and acts just like her deduces that she is an amazingly well-trained impostor" (4). The brain's ability to trick itself is a disorder

of the brain's anatomy, a disconnect between the feeling hypothalamus, and the thinking cerebral cortex, which is, most simply, the root of Capgras. In his article "The Story of the Self and Neurological Realism," Charles Harris explains, "Capgras syndrome therefore reveals a fundamental principle of how the human mind works, eclipsing the traditional binary separating thinking from feelings" (233). When the parts of the brain cannot communicate, the brain malfunctions and disorders manifest. In fact, the duality of thinking and feeling also extends to the internal and the external, or in other words, the inner workings of the brain and the necessary interaction with the physical world in which we live. This dichotomy does not only involve us and our environment, but also the environment and ourselves. Harris concedes this idea: "Capgras syndrome, the novel's key metaphor for our estrangement not only from nature but from 'our own subcortical selves'" (232). The subcortical self is the old self, the fossil that remains in all of us as a testament to our evolutionary pasts.

In conjunction with Capgras delusion, Powers uses the personification of the triune brain through the characters Mark, Karin, and Gerald Weber as a way to frame his idea that the chaos, violence, and uncertainty present throughout the world which serves to separate all things is actually encased by a deep, underriding connectedness that ties all of life together. "Nothing takes place in isolation in Powers's work. Small events can have larger consequences, as environment and individual reciprocally shape and direct each other," demonstrating "the complex web of interdependent nature" ("Science of the Mind" 164).⁷ This interdependent nature plays itself out through the characters in Powers' novel, in conjunction with the triune brain. Mark Schluter, suffering from

⁷ DeLillo also mentions this concept of "interdependent nature" in *White Noise*: "'It's just that on the road everything is linked. Everything and nothing, to be precise'" (207).

Capgras, personifies the R-Complex; Karin Schluter, Mark's older sister, is representative of the paleomammalian brain, and cognitive neurologist Gerald Weber represents the neomammalian brain, as Powers explains: "[Y]ou could think of this trio of central protagonists as a little bit like MacLean's triune brain – one part reptilian, one part limbic, one part cerebral, and all parts improvised, interdependent, perpetually revised, and mutually self-deluding" (Powers Interview by Stephen Burn 178). Although there are three different brains operating independently within a human being, they are also working dependently and rely on one another to carry out basic life functions, just like the characters in the novel.

In *The Echo Maker*, Mark Schluter serves as the embodiment of the reptilian brain. However, unlike Wilder in *White Noise*, Mark is not naturally representative of this section of Maclean's model; Powers uses a trauma-induced brain injury to limit him to reptilian functioning. After rolling his truck on a quiet highway in the middle of the night, Mark is thrust into a world of cerebral disaster when doctors determine that the closed head trauma he experiences causes complications; pressure in Mark's brain climbs, resulting in cerebral edema, or the accumulation of water in the brain: "But when the trauma doctor next talked to [Karin], the words had become *cerebral edema*. Something had spiked the pressure inside her brother's skull. Nurses tried cooling his body. The doctor mentioned a ventilator and ventricular drain" (*EM* 8). Unsure of exactly what is happening in Mark's brain, doctors can do nothing but observe him, documenting changes in his brain activity. "[The doctor] spoke in B waves and millimeters of mercury, lobes and ventricles and hematomas" (*EM* 9). Even though doctors do not know what is happening to Mark psychologically, they use scientific terms in an attempt to explain

what is happening to him biologically.⁸ This use of hyper-scientific terminology to explain human experience is one of the main characteristics of the neuronovel.

Upon waking, Mark has completely lost his sense of self. The human in him is hibernating, replaced by an intensely primitive animal. Specifically, Powers refers to Mark's eyes as animal-like, a tie back to *White Noise*: "She looked away, anywhere but at his animal eyes" (*EM* 7). Due to the brain injuries he sustains in his car accident, Mark's higher-functioning paleomammalian and neomammalian brains are essentially put on stand-by, and he acts according to the dictates of the primal, instinctual reptilian brain. Here, he is caught in a world that is void of language and higher cognitive functions. "He started vocalizing – groans muffled by the tracheotomy tube, a secret, vowel-free language" (*EM* 20). It is through spoken language that we communicate, construct our realities, and form our identities. In an interview with Jill Owens, Richard Powers agrees to this philosophy: "Will the construction of the self always rely on story and consequently on language? Yes, that has to be true." However, at this point in the novel, Mark is unable to speak, further proof that he has lost his former self to the language-free proto-reptilian brain.⁹

In addition to his inability to communicate vocally¹⁰, Mark is also unable to access the brain's higher cognitive functions, such as the ability to use reasoning and critical thinking skills. Instead, he is at the mercy of his most primal instincts, such as

⁸ The doctor talks about Mark's brain activity as he is healing, again using scientific language. "He's piecing himself back together. Activity in the prefrontal cortex is struggling to synchronize into consciousness" (*EM* 17).

⁹ An example of the importance and significance placed on language: "Mark listened, his eyes like half-dollars, as if words were a new life form" (*EM* 35).

¹⁰ In the novel, although Mark can make sounds, he is still void of language. "Words without tongue. He, tongue without words" (*EM* 43).

dominance, aggression, paranoia, the flight response, and sexual impulses (Gould 1). When he first regains consciousness after his accident, Mark immediately reflects the influence these primal instincts hold over him: “Sometimes he gazed at her, weighing if she was edible or a threat. Once, a surge of animal sexuality, forgotten in the next moment. At times she was a crust he tried to brush from his eyes” (EM 20). The reptilian brain’s main anatomical components, the upper brain stem and the thalamus, serve only to carry out survival impulses.

Specifically in Mark’s case, the most prominent traits he exhibits immediately following his accident are his inability to control his aggression and his sexual impulses. The aggressive behavior is something born into all species; often animals will use aggression to respond to the stimuli of fear, or that of dominance. Because upon waking, Mark is in an unfamiliar place, with unfamiliar people, and is feeling intimidated by his surroundings¹¹, he logically responds to the situation with aggression: “He alternated between docility and rage” (EM 34); “Some days his rage was so bad that even lying still infuriated him” (EM 43); “His days were laced with flashes of paranoia, outbursts of pleasure and rage, and increasingly elaborate explanations” (EM 89). In addition to his aggression being out of control, he also exhibits hyper-aggressive sexual impulses, a more complex behavior than aggression, after he has been cognizant for a time. “He grinned and studied her. Then one hand shot out for her sweater-covered breasts while the other grabbed his crotch. Syllables dripped from his mouth: *Fork, fuck a fox, sock suck cunt me...*” (EM 41); “‘Looking good,’ Mark said. ‘Pretty pretty pretty.’ The reptile

¹¹ This is an example of Mark’s instinctual tendency to respond to his environment with primal, reptilian responses. “Now and then, something spooked him, and he thrashed to escape it. Nights were the worst. Once when Karin was leaving for the day, a wave of chemicals bucked through him and he surged upright, scrambling almost to his knees on his hospital bed. She had to wrestle him down to keep him from teaching out his hoses” (EM 20).

brain, creeping out to sun itself” (*EM* 38). Yet another impulse born into all living things, the drive for reproduction is one of the most basal instincts. Combined with the aggression of the reptilian brain, Mark only knows how to react to direct stimuli physically and does not have the ability to really think about his actions, to process them in any sort of internal context.

During the time he begins lashing out with sexual impulses, Mark also regains his ability to imitate speech. He begins to repeat sounds, words, and phrases in a nonsensical way. Doctors discover Mark has developed echolalia,¹² a disorder in which a person automatically mimics sounds he or she hears in the environment. When it is a disorder, the mimicries are uncontrollable and unconscious. While language is a highly complex function of the neocortex, in the instance of echolalia, the language is not complex and is merely repetition without comprehension or cognition. “Mark’s speech traced the same tight loops his walking did. One afternoon it was ‘chick, chick, chick, chick,’ for most of an hour” (*EM* 37); “This launched a barrage of ‘tie shoes, tissues, die your noose.’ He kept it up until she, too, felt brain-damaged. But exhilarated: in the hypnotic repetition, she thought she heard ‘too tight shoes.’ A few loops later, he produced, ‘Shoofly, don’t tie me’” (*EM* 37); “A river of phonemes flowed from the bed. Mark’s arms snaked out. His mouth went *Ah...ah, kee-kee-kee*” (*EM* 27).¹³ While these sounds and words Mark produces are devoid of any meaning, they are a step toward rebuilding his identity. In

¹² Here, Mark’s doctor diagnoses him with echolalia: “‘Echolalia,’ Dr. Hayes called it. ‘Perseveration. He’s imitating what he hears’” (*EM* 36).

¹³ Mark’s echolalia is explained a little more comprehensively: “His pieces still send and receive, but no longer to one another. Words trickle through his head. Less words than sounds. *Goat head. Goat head.* Just a clock ticking, no less than his heart. Sound spatters, like spilled oil. *Goat head. Ram truck. Ram rough. Ram horn. Ghost ahead. Ram a ghost. Goat dead. Slam horn. Done. Breaking. Falling. Plunging under again, no bottom. Words click through his head, an endless freight. Sometimes he runs alongside, peering in. Sometimes these words peer out, finding him*” (*EM* 33).

fact, the first word Mark says is “I”: “The first word comes. It surfaces through a bruise wider than his throat. The skin grown over his mouth tears clear and a word forces through the bloody opening. *I*. The word hisses, taking so long she’ll never hear. *I didn’t mean*” (*EM* 20). The fact that Mark’s first word is “I” is no mistake on the part of Powers. Although the words he produces immediately following his first are nonsensical, the fact that Mark is beginning to produce any sort of language is proof of his inclination for language. This connection between the reptilian brain, void of language, and the neomammalian brain’s language-producing neocortex is evidence of the deep interconnectedness of MacLean’s three brains.

After Mark regains his ability to speak, doctors diagnose him with Capgras, a rare identification delusion.¹⁴ The brain’s inability to communicate between the amygdala and inferotemporal cortex results in identity confusion.

In Capgras, the person believes their loved ones have been swapped with lifelike robots, doubles, or aliens. They properly identify everyone else. The loved one’s face elicits memory, but no feeling. Lack of emotional ratification overrides the rational assembly of memory. Or put it this way: reason invents elaborately unreasonable explanations to explain a deficit in emotion. (Powers Burn Interview 106)

These “unreasonable explanations” invented by Capgras patients result in confusion, frustration, and hostility toward the people, places, and things with which they previously

¹⁴ Here, doctors diagnose Mark with Capgras, and briefly explain the disorder: “Your brother is manifesting a condition called Capgras syndrome. It’s one of a family of misidentification delusions. It can occur in certain psychiatric conditions” (*EM* 60).

“Capgras is also reported in closed-head trauma, although that’s incredibly rare. Damage in precise, probably multiple spots...there are only a couple of cases in the literature. Your brother is the first accident-induced Capgras patient I’ve ever seen” (*EM* 60).

had deep emotional connections to.¹⁵ In Mark's case, he becomes suspect of his dog, his home, and most notably, his sister, Karin. "My sister? You think you're my sister?" His eyes drilled her. "If you think you're my sister, there's something wrong with your head" (EM 59). This confusion of identity Capgras patients experience often results in rage and violence because the mind cannot explain the feelings of alienation from those things most emotionally intimate to the patient. For example, Mark's reaction to Karin demonstrates these reactive, animalistic tendencies: "And the look he flashed her then was like some wild thing, cornered. He looked almost ready to hurt her. She'd read the articles: the rate of violent behavior in Capgras patients was well above average" (EM 89). While patients are struggling to make sense of the world due to the disconnect between their hypothalamus and cerebral cortex, they result to behavior characteristic of the survival impulse, which is regulated by the reptilian brain's main components, the thalamus and upper brain stem. Powers reiterates this reference to the triune brain in *The Echo Maker* when Weber muses "Three parts needed to complete a recognition, and the oldest trumped all" (EM 131). This disconnect between the different areas of the brain leaves Capgras patients, like Mark, stumbling around in the dark, relying on their reptilian brains to process the sensory and cerebral information they receive.

¹⁵ Here, Mark demonstrates some of the typical thoughts and feelings associated with a Capgras patient; "In some hard-to-measure way, you don't match up with his image of you. He knows he has a sister. He remembers everything about her. He knows you look like her and act like her and dress like her. He just doesn't think you *are* her" (EM 60).

More examples from the novel explaining Capgras: "The Capgras sufferer almost always misidentifies his loved ones. A mother or father. A spouse. The part of his brain that recognizes faces is intact. So is his memory. But the part that processes emotional association has somehow disconnected from them" (EM 61).

"He sees what he always sees. He just doesn't...feel you sufficiently to believe you" (EM 61).

Past the proto-reptilian brain is the paleomammalian brain. Karin, Mark's older sister, is Powers' representation of the paleomammalian brain. Just as this brain is governed by the feeling limbic system, Karin, too, is governed by her emotional self. As in *White Noise*, Powers, like DeLillo, use female characters to represent the emotional mammalian brain. Among her tendencies for emotionality, Karin's devotion and maternal instincts are striking. In Paul MacLean's book, he cites the development of maternal feelings as evidence of the formation of the paleomammalian brain. "In mammals, the origination of nursing conjoined with maternal care marks the beginning of the evolution of the family and its associated parental responsibility" (16). In Powers, Karin is, above all, a maternal figure for Mark. She has been his lifelong caregiver, raising him as a child and taking care of him as an adult; "She owed her own competence to raising her brother. He was her psychology experiment" (*EM* 24). Karin was more involved than her parents in raising Mark as a child.¹⁶ Now, as an adult, Karin is once again in the maternal role of taking care of and protecting her brother. Her devotion to Mark while he is recovering is astounding: "But she fed and walked and read to him tirelessly, never doubting that he would come back. She had more energy for rehabilitation than she's had for any job she's ever worked" (*EM* 37). Karin gives up her job, her apartment, and especially her peace of mind in order to fulfill the familial role of caregiver for her brother, a testament to MacLean's assertion of evolution of the family as demonstrated by the limbic system's behavioral tendencies.

Along with her propensity to mother, Karin also exhibits other, less abstract behaviors governed by the paleomammalian brain. For instance, after hearing about

¹⁶ Evidence from the text regarding Karin's maternal role: "Karin, from the earliest age, playing babysitter, earning her two dollars by keeping her little brother alive for another night" (*EM* 21).

Mark's accident, Karin immediately reacts emotionally, instead of responding with action. "She sat down on the kitchen floor and cried" (*EM* 12).¹⁷ She instinctually reverts to her emotions to interact and react to situations around her. While this reaction to a traumatic event might seem typical, Powers emphasizes Karin's mammalian tendencies even more, specifically through her inclination to comfort others. Before leaving her home and life in order to care for Mark, Karin is a customer relations employee – it is her job to make other people feel good about themselves and to placate any upset customers.¹⁸ "People like people who make them feel secure" (*EM* 25). This ability to relate to people on a personal and emotional level relies on the ability to empathize with people, a skill that helps demonstrate Powers' theme of interconnectedness, as well as MacLean's assertion that the three brains in his model all work independently.

Just as the triune brain theory hypothesizes that the three parts of the brain work interdependently, one of Karin's most outstanding traits, her ability to empathize with people, is governed by a structure located not in the limbic system, but in the neocortex.¹⁹ Especially when she is situated in circumstances where she feels out of place and uncomfortable, or in situations that are emotionally taxing, she uses her ability to empathize to help her process and survive the situations.²⁰ "Her old chameleon complex. Be the one you're with" (*EM* 71). The insular cortex, a structure in the cerebral cortex,

¹⁷ Another example of Karin's emotionality: "She pulled his chest up against her face and began to cry" (*EM* 37).

¹⁸ Karin's ability to be empathetic with people and exercise her emotionality through her job: "We need people who can make others feel good about themselves. Experience in customer relations would be perfect!" (*EM* 90).

¹⁹ Here, Powers shows that Karin exercises her empathy when dealing with distress in others: "Her face was numb, as if *she* had been the one lying out there, in the freezing February night" (*EM* 5).

²⁰ This is another example of Karin's ability to empathize, an example of her "chameleon complex": "Watching the therapists, she learned how to play each mood" (*EM* 34).

which is located between the temporal lobe and frontal lobe, holds the brain's ability to share the feelings and emotions of someone else – empathy. However, although the insular cortex is a feature of the neocortex, and therefore of the neomammalian brain, it can actually be considered a limbic structure by scientists because it connects the two areas of the brain, conveying important chemical messages regarding the interpretation of the internal and external worlds (Chen 43). The placement of a limbic structure in the neocortex, and subsequently Karin's behaviors being dictated by a structure located in the neomammalian neocortex, is yet another example of the theme of interconnectedness that runs through both Powers and MacLean.

The third and final part of the triune brain, the neomammalian, is represented by Dr. Gerald Weber, a “well-known cognitive neurologist from New York” (*EM* 93). In fact, the character shares the first name of Gerald Edelman, a widely-known and respected biologist and neurologist who won the Nobel Prize in 1972; Edelman is the scientist who pioneered the highly-influential theory of Neural Darwinism²¹. As the neomammalian brain houses structures that are the highest functioning and most complex, it is only fitting that the neuroscientist is Powers' embodiment of the section. Weber is famous for his case studies, which focus more on listening to his patients and less on telling about their symptoms.²² “But even when Dr. Weber wrote about people

²¹ In an interview with Edelman, published on *NPQ* in 2004, *NPQ* gives the following description of Edelman: “One of the world's foremost experts on the brain and consciousness, he is a founder and director of the Neurosciences Institute in La Jolla, Calif., a ‘scientific monastery.’” In the interview regarding Neural Darwinism, he said, “The universe is not meaningless when considered in terms of biological systems. Survival through natural selection strongly influences the value systems of the brain. Survival during evolution means that value systems are biased toward life” (*NPQ*). The theory of Neural Darwinism is implicitly connected with MacLean's triune brain.

²² Here are examples of Weber acting much like the neuroscientists in writing neuronarratives: “He wrote in a modest voice and ordinary style that placed more faith in individuals' stories than in prevailing medical

stripped of words, stuck in time, or frozen in pre-mammalian states, he seemed to treat them all like his nearest kin” (*EM* 94). Weber’s narrative combines Freud’s personalization of patients with psycho-neural disorders in his psychonarratives, which, combined with neural disorders, is representative of the neuronarrative of scientists such as A.R. Luria, Oliver Sacks, and V.S. Ramachandran.

Sent to bring insight into Mark’s condition, Weber’s job as a neuroscientist indicates that he is a highly intelligent man who operates primarily in the neomammalian section of the brain. This section is responsible for “complex stimulus analysis, precise and variable/learned aspects of motor control, further enhancement of learning and memory, and abstract, rational thought,...[and] it is also responsible for language, planning, introspection, and self-awareness” (Gould 2). While he exhibits all of the functions of the neomammalian brain, Powers’ depiction of Weber’s questioning of himself throughout the novel highlight his place as the embodiment of the neomammalian brain. Throughout the novel, the three main characters – Mark, Karin, and Weber – all struggle to come to terms with their identities. Due to Capgras, Mark loses his sense of self, as well as his sense of the identity of others; by the end of the novel, he still cannot establish the identities of those around him, let alone his own. Always seeking relationships based on emotional ties and approval, Karin does not fully realize who she is. Conversely, Weber is the only character who comes around full-circle and connects both the internal and the external with the “I.” After questioning his identity throughout

wisdom. ‘Now more than ever’...’especially in the age of digital diagnosis, our combined well-being depends less on telling than on listening” (*EM* 93).

“He called them all by fictional names. When the details of a life threatened anyone’s privacy, he substituted others. Sometimes he created a single case history from a composite of several people he’d studied. That much was standard professional practice, for everyone’s protection” (*EM* 106).

the course of the novel, he finally understands his place within himself, within his relationships with people, within his past, and within the wider scope of his environment.

Weber begins his journey toward self-discovery when he stops to think, “What does it feel like to be a bird?” (*EM* 424), an echo back to Nagel’s famous article “What is it Like to Be a Bat?” This question leads him to an epiphany; “Something looks out from the prehistoric bird, a secret about him, but not his. A look of pure wildness, all the hard intelligence of simply *being* that Weber has forgotten” (*EM* 424). This connection with the organic roots in his brain, the connection of bird to human, allows Weber to shed his former beliefs and permits his identity to be influenced by nature. Then, when Weber escapes his life and sneaks away with Barbara, “he comes apart...He has wrecked himself, and it’s good beyond saying. No writer, no researcher, no lecturer, no husband, no father. *He* has precipitated out. Nothing left but sensation, the warm, the light pressure against his ribs” (*EM* 428). Here, readers see Weber’s dismantling. He sheds all of the externally-prescribed identities with which he has been wrestling for the majority of the novel. He stops questioning himself and, instead, lets himself go. “His mirror neuron networks honed, his empathetic pathways cleared, Weber now sees himself in Mark and Mark in himself as well as recognizing kinship with the cranes” (Harris 246). Weber’s final realization echoes Powers’ theme, that in constructing identity, everything connects. Where reptilian Mark and paleomammalian Karin failed, Weber’s path to self-realization demonstrates the complex intellectual superiority of the neomammalian brain. And, in a tie to *White Noise*, where Heinrich fails because he does not allow his thoughts to be supplemented by the physical world, interconnected Weber finds the path to self-

actualization when he lets his lesser brains communicate with his complex neomammalian brain.

Mark, Karin, and Weber are not the only personifications in the novel that serve to further Powers' agenda. In addition to the three main characters serving as segments of the triune brain, Powers also infuses his complex novel with another element from MacLean. In his book, *The Triune Brain in Evolution: Role in Paleocerebral Functions* (1990), MacLean details not only the cognitive evolution of both reptiles and mammals, but also of birds. He describes birds as the link between the development of the reptilian and the mammalian brains (43). In *The Echo Maker*, Powers uses sandhill cranes as an encompassing component of the triune brain theory, and so develops a frame within a frame structure in the novel. Daniel, Karin's friend and lover from the past, serves as the characterization and personification of the cranes in the novel. A naturalist, Daniel operates according the principals of Buddhism and worships the divine impulses that unite all life. The human incarnation of the cranes, Daniel's physical description is reminiscent of a bird; "He felt just as she remembered him: steady, mammalian, familiar. He looked unchanged since high school: the long, sandy hair, the wisp of goatee, the narrow, vertical face: a gentle seed-eater. His continuity comforted her, now that all else had changed" (*EM* 53). Daniel's continuity evokes the theme of connectedness – he does not change. His cyclic nature is present not only in how other characters perceive him, but are ever-present in his life philosophies: "Reduce, reuse, recycle, retrieve, redeem" (54); "No one is on a separate path. Everything connects. His life, yours, hers, his friends' . . . mine. Other" (*EM* 72). This philosophy of interconnectedness mirrors MacLean's theory of the triune brain.

Additionally, Daniel's ideas mirror MacLean's regarding the dangers of breakdowns and divisions. While MacLean's theory warns of the dangers associated with a disconnection between the brains, Daniel fears a disconnection between that which connects life and nature. "He simply wanted people to be as selfless as they should be, humbled by the million supporting links that kept them alive, as generous with other as nature was with them" (*EM* 54). Much as a breakdown between the three brains leads to pathological behavior, Daniel knows that a breakdown of the ecological environment will have disastrous effects. For him, a naturalist working for a refuge, he is preoccupied with the importance of the conservation and preservation of nature, and specifically of the Sandhill cranes. Powers employs "[this] networked ecology that mirrors the networked ecology of all life, including the birds, the core parts of whose brains are still contained in our own" (Harris 232). The cranes, a reminder of our past, are a representation of Powers' theme of connectedness, as well as Darwin's influence on MacLean's evolutionary triune brain.

This overarching theme of connectedness is present not only through Daniel, but also through his use of the cranes. The cranes serve as an extension of Daniel and as a framing device, their presence always interrupting the narrative of the novel and consistently appearing at pivotal moments throughout the storyline. The cranes make their appearance at the beginning of each of the three sections of the novel, as well as throughout each of those three sections, and their appearance always seems to come when an event significant to the storyline is taking place. The cranes are employed as a constant, as something to measure the events of the story against, like the triune brain and Jack in *White Noise*. They serve as a haunting reminder of Paul MacLean's Darwinian

structure of the brain – we all carry with us the shadows of our past. Harris reflects on the idea of our internalized pasts in his essay: “‘Although higher-order consciousness ‘developed in the brain recently in evolutionary history,’ it is . . . ‘layered on top of all the other processes that already existed’” (Harris 235). Powers’ inclusion of the birds helps to remind readers of the connection that courses through all of life, and to remind us that: “‘The brain is a mind-boggling redesign. But it can’t escape the past. It can only add to what’s already there’” (*EM* 17). That primal part of our brains that still exists in reptiles is an inescapable part of our being, something that connects us all.

In terms of the neuronovel, *The Echo Maker* serves dual functions: with the use of the triune brain theory, the novel is a case study of Mark Schluter, a man suffering from Capgras delusion, as well as a case study of life, expounding on its complexities and subtle links that often go unnoticed. In a roundtable discussion, Powers addresses his intentions: “This was my aim in *Echo Maker*: to put forward, at the same time, a glimpse of the solid, continuous, stable, perfect story we try to fashion about the world and about ourselves, while at the same time to lift the rug and glimpse the amorphous, improvised, messy, crack-strewn, gaping thing underneath all that narration” (“*Echo Maker Roundtable #5*”). Powers employs the overarching theme of connectedness through his use of the Sandhill cranes and the triune brain to mimic the natural inclination for narration. Then, he uses Capgras syndrome and the personification of the triune brain to remind readers of the chaotic existence we all live in, a life that is unpredictable and disorganized.

Conclusion: Jonathan Lethem and *Motherless Brooklyn*: The Tourettic Triune Brain

Unlike DeLillo and Powers, Jonathan Lethem has not been as explicit about his awareness of neuroscience and the triune brain, and there is not nearly as much critical literature devoted to his work. Still, he has revealed his attraction to DeLillo's *White Noise*,²³ as well as an interest in Oliver Sacks. In addition to writing a book called *The Vintage Book of Amnesia* in which he uses an essay by Oliver Sacks,²⁴ he also recognizes Sacks as an influence upon his novel, *Motherless Brooklyn*. In an interview with *Postroad*, he says, "I'd been gathering interest in and material about Tourette's half-consciously, reading Oliver Sacks and watching a documentary called 'Twitch and Shout' and becoming responsive to the material in ways I couldn't explain." Moreover, although Lethem does not specifically refer to the triune brain in any of his interview, other critics have linked *Motherless Brooklyn* to the theory.²⁵ In *Motherless Brooklyn*, Lethem uses the triune brain theory as a way to bridge Nagel's explanatory gap: instead of externalizing the internal, as in *White Noise* and *The Echo Maker*, Lethem takes a different approach and instead internalizes the disorder, by personalizing Tourette's syndrome.

In his neuronarrative *The Man Who Mistook His Wife for a Hat*, Oliver Sacks offers a comprehensive description of Tourette's syndrome:

²³ In an interview with *Postroad*, when asked if he had any favorite books he reads again and again, Lethem responded that DeLillo, specifically *White Noise*, was on the list.

²⁴ Lethem discusses his use of Sacks in his novel in an interview with Zachary Houle (2000).

²⁵ In his article "The Poetics of Tourette's Syndrome," Robert Schleifer discusses Lethem in light of work regarding the triune brain: "The latest experimental work on the neurology of language, as outlined in Philip Lieberman's remarkable book, *Human Language and Our Reptilian Brain*, argues forcefully and persuasively for tight connections between motor activity and language skills by focusing on the seat of vertebrate motor activity in the subcortical basal ganglia" (566).

In 1885, Gilles de la Tourette, a pupil of Charcot, described the astonishing syndrome which now bears his name. “Tourette’s syndrome,” as it was immediately dubbed, is characterized by an excess of nervous energy, and a great production and extravagance of strange motions and notions: tics, jerks, mannerisms, grimaces, noises, curses, involuntary imitations and compulsions of all sorts, with an odd elfin humour and a tendency to antic and outlandish kinds of play. In its “highest” forms, Tourette’s syndrome involves every aspect of the affective, the instinctual and the imaginative life; in its “lower,” and perhaps commoner, forms, there may be little more than abnormal movements and impulsivity, though even here there is an element of strangeness.... It was clear to Tourette, and his peers, that this syndrome was a sort of possession by primitive impulses and urges: but also that it was a possession with an organic basis – a very definite (if undiscovered) neurological disorder.

(92)

This disorder Sacks describes is a neuroscientifically complex dysfunction of some of the brain’s structures, and the disease manifests itself due to this disconnect between the brain’s structures. Following MacLean’s triune brain hypothesis, a breakdown in communication can result in materialization of a disorder, and in this case the brain’s inability to communicate with the proper parts results in Tourette’s syndrome.

In his description of the disorder, Sacks mentions tics, or the outward symptoms of the syndrome that come to light due to this misfiring of a person’s biology. The structures of the brain that contribute to the symptoms and are associated with Tourette’s

syndrome are: the neocortex, specifically Broca's area (located in the frontal lobe, and responsible for the production and processing of language), and Wernicke's area (located in the posterior area of the cortex, and responsible for the understanding of written and spoken language), the thalamus (relays sensations and motor signals to the cerebral cortex), the hypothalamus (controls autonomic functions), and the amygdala (controls memories and emotions).²⁶ Tourette's occurs in patients because the structures associated with the disorder cannot communicate due to a malfunction in the basal ganglia, located in the proto-reptilian brain, which connect the cerebral cortex, located in the neomammalian brain, with the thalamus, located in the paleomammalian brain. When communication between the different parts of the brain breaks down, symptoms of Tourette's manifest themselves.

The symptoms of Tourette's can range from motor tics, vocal tics, obsessive-compulsive disorder (OCD), attention-deficit-hyperactivity disorder (ADHD), problems with impulse control, as well as other behavioral problems (Robertson). In *Motherless Brooklyn*, the protagonist, Lionel Essrog, begins to manifest Tourette's at a young age, and his symptoms begin with motor tics. "I set out to read every book in that tomblike library, every miserable dead donation ever indexed and forgotten there – a mark of my profound fear and boredom at St. Vincent's and as well an early sign of my Tourettic compulsions for counting, processing, and inspection" (*MB* 37). The physicality of touching, counting, and cataloging the books is an example of the obsessive motor tics that manifest themselves in Tourette's patients. "In fact, I wanted to run my hands through the clothes on the bed, snap the suitcase latches open and shut, lick the vinyl" (*MB* 100). The reptilian brain is represented by the bodily-related aspect of Tourette's –

²⁶ See Ronald Schleifer's "The Poetics of Tourette Syndrome: Language, Neurobiology, and Poetry" (1).

specifically in the motor tics. Tics are “repetitive, stereotyped movements or vocalizations, such as blinking, sniffing, facial movements, or tensing of the abdominal musculature” (Robertson). These motor tics are representative of the reptilian brain because this brain is preoccupied with the most primal impulses. Motor tics are carried out without thought – they happen automatically, instinctually. Because the proto-reptilian brain is “involved with reflexive and instinctive behaviors” such as “ritual displays and nonverbal communication,” it is logical to link these tics with the reptilian brain.

In another parallel to the reptilian brain, in the novel, Lionel is a detective. As such, he is often on stakeouts and is constantly on edge, always waiting for someone to sneak up behind him. This constant defensive state parallels the reptilian brain’s function of the survival instinct. Lionel is hyper-defensive throughout the novel, Lethem going far enough as to compare him to a lizard; “I whipped around, my lizard instincts shocked at having allowed someone to sneak up on me” (*MB* 34). He is always on the alert, defensive and aggressive. “My neck prickled, alert to wind and fear” (*MB* 144). In addition to his career being related to the reptilian brain, the motor tics he manifests on account of his Tourette’s also reflect the brain’s functions. Throughout the novel, Lionel manifests many different motor tics, but the most prevalent of his motor tics is his need to touch the things around him.

I caressed the nearest penguin, one mounted low, shown diving in pursuit of a delectable fish, patted its head, stroked its gullet as though helping it swallow a dry pill. Gilbert guffawed, thinking I was performing comedy for him, when in fact I’d been overwhelmed by a tender, touchy impulse

toward the stiff, poignant penguin. Now it became imperative that I touch all the penguins...once I'd touched the first penguin I had no choice. (*MB* 41)

The impulsive need for touching, again, emphasizes the reptilian complex. As the novel progresses, so do Lionel's motor tics. In addition to his touching compulsion, he develops eye tics: "Very much in the grip, I modified the words into a growling sound, along the lines of '*whrywhroffsinko*,' – but the effort resulted in a side-tic: rapid eye blinks" (*MB* 31). When his physical tics get to be too much, Lionel relies on other base remedies to help quiet his symptoms. The first of these tonics is eating; "I focused on my plate – eating was for me already by then a reliable balm" (*MB* 71). Eating is involved in one of the Four F's regulated by the R-complex's hypothalamus – feeding (Gould 1). While eating helps to manage his Tourette's symptoms, Lionel himself says that his best soothing technique is sex.

Sexual excitement stills my Tourette's brain, not by numbing me, dimming the world like Orap or Klonopin, those muffling medications, but instead by setting up a deeper attentiveness in me, a finer vibration, which fathers and encompasses my urgent chaos, enlists it in a greater cause, like a chorus of voices somehow drawing a shriek into harmony. I'm still myself and still in myself, a rare and precious combination. Yes, I like sex very much. I don't get it very often. When I do, I find I want to slow it down to a crawl, live in that place, get to meet my stilled self, give him a little time to look around. (*MB* 103)

The sex drive is a function again included in the Four F's and controlled by the hypothalamus – reproduction. The fact that Lionel's tics are quieted by something as primal and basal as sex is proof of the overriding influence the reptilian brain has on his actions.

While the motor tics are only the bodily fruition of the disorder, the disorder also manifests itself through vocal tics. “[These] uncanny verbalizations of Tourette's, as David Morris has argued, are apparently connected ‘to subcortical structures [of the brain] that permit them to tumble out unbidden, like a shout or cry’” (qtd. in Schleifer 563). Biologically, language is made and processed in the brain's neurocortex, in the neomammalian brain. Language is one of the most highly-complex functions of the human brain, and it is here that Lionel experiences the most numerous and intense of his tics; “...speech, it turned out, liberated me from the overflowing disaster of my Tourettic self, turned out to be the tic that satisfied where others didn't, the scratch that briefly stilled the itch” (*MB* 57). For Lionel, speech becomes a way to identify himself, a way to identify his disorder, and, interestingly, it also becomes a way to cope with his disorder.²⁷ As he enters one of his favorite restaurants, Lionel reflects “Papaya Czar's walls are so layered with language that I find myself immediately calmed inside their doors, as though I've stepped into a model interior of my own skull” (*MB* 160). Lionel recognizes something of himself in the seeming chaos of language and continually takes refuge in it.

This affinity to language manifests itself when Lionel is young and growing up in the boy's home. Here, he begins to notice how different he is from the other boys. He

²⁷ Another example of Lionel's compulsion for language. “Language bubbled inside me now, the frozen sea melting, but it felt too dangerous to let out. Speech was intention, and I couldn't let anyone else or myself know how intentional my craziness felt... So, though I collected words, treasured them like a drooling sadist captor, bending them, melting them down, filing off their edges, stacking them into teetering piles, before release I translated them into physical performance, manic choreography” (*MB* 47).

knows he is different from other people, and tries to find who he is. Lionel reflects, "...[I] couldn't find the language of myself, as I failed to in watching television,...but I didn't find myself there,...[they] weren't showing me what I needed to see, weren't helping me find the language" (*MB* 37). Because he does not have the language to identify himself, he becomes even more isolated. As he gets older, he has impulses he cannot explain, which leads him to be the target of random beatings and bullying. To escape, he takes refuge in the school's library, combing through books and trying to find his identity in the words that have started to take over his thoughts.

Meantime, beneath that frozen shell a sea of language was reaching full boil. It became harder and harder not to notice that when a television pitchman said *to last the rest of a lifetime* my brain went *to rest the lust of a loftomb*, that when I heard 'Alfred Hitchcock,' I silently replied 'Altered Houseclock' or 'Ilford Hotchkiss,' that when I sat reading Booth Tarkington in the library now my throat and jaw worked behind my clenched lips, desperately fitting the syllables of the prose to the rhythms of 'Rapper's Delight'..., that an invisible companion named Billy or Bailey was begging for insults I found it harder and harder to withhold.

(*MB* 46)

Lionel, still unsure of what is happening to him, tries and tries to make sense of his Tourettic world through the language of the neocortex, an example of the neuronovel's purpose of bridging the gap between subjective experience and scientific language.

Lionel's Tourettic language takes many forms. One of the most prominent language tics found in Tourette's patients is echolalia, the same disorder Mark manifests

in *The Echo Maker*. Throughout the novel, Lionel makes many references to his echolalia tendencies. “Minna encouraged me to have a take on everything, and to spit it out, as though he thought my verbal disgorgings were only commentary not yet anchored to subject matter. And he adored my echolalia. He thought I was doing impressions” (*MB* 57); “Of course after any talk my brain was busy with at least some low-level version of echolalia salad: *Don’t know from Zendo, Ken-like Zung Fu, Feng Shui master, Fungo bastard, Zen masturbation, Eat me!*” (*MB* 4). Echolalia is not the only vocal tic present in Tourette’s patients. Coprolalia (the involuntary swearing or use of inappropriate words or phrases),²⁸ or palilalia, (repetition of one’s own speech which may sound like stuttering) are other vocalizations of Tourette’s that are also present in *Motherless Brooklyn*. Lionel’s echolalic tendencies demonstrate the disconnect of the neocortex due to the malfunctioning of the basal ganglia, the disconnection causing the disorder.

While Tourette’s is a disorder of the mind and the body (language and motor tics), another key part of the disorder is emotions. For Lionel especially, emotions are the connection between the mind and the body, dictating the amount and severity of his tics. In the novel, readers see Lionel’s ticcishness wax and wane according to the situations in which he finds himself; his paleomammalian brain serves as a kind of conduit between Tourette’s oral and motor tics. In “The Poetics of Tourette’s Syndrome,” Schleifer reflects this idea: “...the neurobiology of emotions – which include joy, sadness, and a seemingly innate ability of primates to respond to faces – is closely connected to the strength and strange fascination of Tourette’s Syndrome, its *situation* at the juncture of motor and verbal resources, between the intentional verbal meanings of discourse and its

²⁸ An example of Lionel’s coprolalia: “Needless to say, it wasn’t commentary and impressions, but my verbal Tourette’s flowering at last. Like Court Street, I seethed behind the scenes with language and conspiracies, inversions of logic, sudden jerks and jabs of insult” (*MB* 57).

seeming unintended force” (569). Most of the time, Lionel’s tics are the worst when he is experiencing negative emotions and situations, like stress, anxiety, fear, and frustration.²⁹

Due to the nature of Lionel’s job, he is constantly subjected to the negative feelings of anxiety. In an article published in *Psychological Review* entitled “From Normal Fear to Pathological Anxiety,” research conducted by Jeffrey Rosen, and Jay Schulkin proves that anxiety originates from the amygdala. “Our hypothesis is that the amygdala and its connections play a central role in both normal fear and pathological anxiety and is complementary to that proposed by Joseph LeDoux (1996) in his recent book *The Emotional Brain*” (326). Because the amygdala is located in the limbic system, anxiety is a paleomammalian response. Lionel’s repeated exposure to anxiety-ridden situations produces more severe tics: “The tics were always worst when I was nervous, stress kindling my Tourette’s” (*MB* 11); “Now my tics were quieted – stress was one thing, animal fear another” (*MB* 17). This anxiety, coupled with his feelings of fear, stress, and frustration, show the paleomammalian brain’s influence on the severity and intensity of Tourette’s language and motor tics.

Yet another example of the paleomammalian brain’s influence over Lionel is his affinity to music. In addition to sex and food,³⁰ the only other fixation that really calms his Tourette’s is music, and particularly the music of Prince.

To that point in my life I might have once or twice heard music that toyed with feelings of claustrophobic discomfort and expulsive release...but

²⁹ An example of Lionel’s Tourette’s symptoms manifesting due to frustration: “I was ticcing out of sheer frustration” (*MB* 216).

³⁰ Lionel reiterates the only things that calm his Tourette’s: “Prince’s music calmed me as much as masturbation or a cheeseburger” (*MB* 128).

here was a song that lived entirely in that territory, guitar and voice twitching and throbbing within obsessively delineated bounds, alternately silent and plosive. It so pulsed with Tourettic energies that I could surrender to its tormented, squeaky beat and let my symptoms live outside my brain for once, live in the air instead. (*MB* 127)

The attraction to music as an emotional outlet is known as musical emotion, described by musical cognition theory. In a study titled “Music: A Link Between Cognition and Emotion” by Carol Krumhans, she explores the emotional impact of music. In her study, she finds that “Music emotions change over time in intensity and quality, and these emotional changes covary with changes in psycho-physiological measures” (*MB* 45). Because Lionel is constantly caught between the fearfulness and tics of the reptilian brain and the explosive language of the neomammalian brain, the neomammalian brain serves not only as a conduit between his reptilian and neomammalian brains, but also as a safe haven. So music, and particularly the chaotic, Tourettic music of Prince, offers an emotional release for Lionel paleomammalian brain.

In *Motherless Brooklyn*, Jonathan Lethem showcases Paul MacLean’s triune brain theory not through personifications of the brain’s three sections as in DeLillo and Powers, but through the disorder Tourette’s syndrome. In this novel, Lionel Essrog is the first-person focus of the case study detailing the disorder-ridden life of a postmodern man. The inherent inclusion of the triune brain in Tourette’s syndrome demonstrates the pervasiveness of the theory throughout literature. Also, the triune brain and Tourette’s syndrome showcase the postmodern author’s attempt at showing subjective experience through the use of the scientific language, a key concept of the neuronovel.

As demonstrated through the examples from DeLillo's *White Noise*, Powers' *The Echo Maker*, and Lethem's *Motherless Brooklyn*, the use of scientific language to tell the subjective story of the postmodern condition is a prevalent theme throughout these science-informed novels. The juxtaposing language of science and fiction serve to assist closing the void between experience and subjectivity. The development of this genre is the result of the increasing interest in things brain-related, combined with the evolution of the psychonarrative, to the neuronarrative, and then to the neuronovel. The influence of psychologists and scientists like Sigmund Freud, A. R. Luria, and Oliver Sacks is evident in the present-day work of fiction authors.

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