THE RHETORICAL BRAIN: ARTICULATING MIND AND MATTER IN CONTEMPORARY NEUROSCIENCE

by

DAVI A. JOHNSON

(Under the Direction of Kevin M. DeLuca)

ABSTRACT

The circulation of scientific brain images in popular discourses is part of a more general shift in contemporary conceptions of the relationship between biology and society. The present arrangement of biology and society is “biosocial,” characterized by a merging of biological and social categories. This arrangement has significant consequences for the production and constitution of individual and collective identities. In this project, I trace the discursive shifts in ways of talking about the self, science and society that accompany the development of imaging technologies that allow us to visualize the brain. Through a rhetorical analysis of self-help books, popular media coverage of babies’ brains, and public policy speeches about early childhood education, I argue that science is being transformed into a social discourse at the same time that society is increasingly understood in biological vocabularies. This double movement results in a host of material and social consequences, ranging from the breakdown of institutional boundaries demarcating schools, hospitals and families, to the increasing ingestion of psychopharmaceuticals for the control of mood and behavior. This rearrangement of social and biological categories of thought poses both risk and opportunity for ethical subjects. As these shifts challenge the efficacy of traditional modes of political action, new opportunities for rearticulating subjects and societies emerge.

INDEX WORDS: Articulation, Biosocial, Brain Imaging, Neuroscience, Psychiatry, Rhetoric of Science

THE RHETORICAL BRAIN: ARTICULATING MIND AND MATTER IN CONTEMPORARY NEUROSCIENCE

by

DAVI A. JOHNSON

B.A., Samford University, 2000

M.A., University of Georgia, 2002

A Dissertation Submitted to Graduate Faculty of The University of Georgia in Partial

Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2006

THE RHETORICAL BRAIN: ARTICULATING MIND AND MATTER IN

CONTEMPORARY NEUROSCIENCE

by

DAVI A. JOHNSON

Major Professor: Kevin M. DeLuca

Committee: Celeste Condit
Christine Harold
Thomas Lessl
Elizabeth Preston

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
August 2006

ACKNOWLEDGEMENTS

This project has been, in part, a struggle with the notion of authenticity. C.S. Lewis makes a helpful distinction between two different senses of "pretending." In the first sense, pretending is the deceptive acting-out of an inauthentic identity, a straying from who one is in order to play at being something one is not. In this sense, authenticity precedes pretension, making the latter a necessarily deceptive or corrupting activity. In the second sense, however, pretending is at the heart of everything that can be described as education. We must blindly adopt the actions that will eventually come to constitute our identities. The student first learns by imitating his or her teacher, and only through practice are these actions assimilated into one's identity. In this latter sense, pretending precedes authenticity (as often, action precedes understanding).

My entire education can be seen as an exercise in pretending to be an authentic scholar. I have been fortunate enough to have had excellent teachers to imitate, teachers who have been extraordinarily patient with my misguided arrogance and faltering attempts to become an ethical thinker, teacher, and writer. Specifically, I would like to thank Kevin DeLuca who has consistently challenged me to think differently. I would also like to thank Celeste Condit, Tom Lessl, Mike Janas, Christine Harold and Beth Preston for being scholars of integrity who have shown me patience, wisdom, and passion for thought and life. Finally, I would like to thank Kristy, Dylan and Shannon, for offering invaluable support and friendship. I hope that my continued interactions with all of these people and the many others I have not mentioned will aid in my lifelong pursuit of developing into an authentic scholar.

TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS iv

CHAPTER

1 BEYOND TRUTH, BEYOND THERAPY: AN INTRODUCTION 1

2 VISIONS OF THE NEW BRAIN: HISTORICAL ARTICULATIONS OF MIND AND MATTER 35

3 "HOW DO YOU *KNOW* UNLESS YOU *LOOK*?" SCIENTIFIC BRAIN IMAGING AND CONTEMPORARY TECHNOLOGIES OF THE SELF 64

4 ARTICULATING NATURE AND NURTURE: BABIES, BLANKS SLATES, AND BRAIN-BUILDING 101

5 BIOSOCIAL DISCOURSE IN PUBLIC POLICY: THE NATIONAL AGENDA OF BUILDING AMERICAN CITIZEN 132

6 THE BRAIN IS THE FRONTIER 159

REFERENCES 176

CHAPTER ONE

BEYOND TRUTH, BEYOND THERAPY: AN INTRODUCTION

In October of 2003, The President's Council on Bioethics released a report entitled *Beyond Therapy: Biotechnology and the Pursuit of Happiness*. In the opening letter, Chairman Leonard Kass (2003) pinpoints the focus of the report as the "dual uses" of recent technologies that alter mind and body (p. xv). The same technologies are attractive not only to people who are "sick," but also to normal people who simply want to perform better in their daily lives. Kass summarizes the conclusions of the Council: "We want to be happy—but not because of a drug that gives us happy feelings without the real loves, attachments, and achievements that are essential for true human flourishing" (2003, p. xvii). The safeguarding of an *authentic* human existence is, at least partially, a rhetorical problem: "We will need to hold fast to an account of the human being, seen not in material or mechanistic or medical terms but in psychic and moral and spiritual ones" (p. xvii). It is only by holding fast to a humanistic vocabulary that we can enjoy the fruits of biotechnology without succumbing to its dangerous temptations. Despite the warnings of President George W. Bush's Council, humanistic vocabularies are being supplanted or, at the least, heavily supplemented by therapeutic vocabularies that medicalize a host of human experiences and behaviors that were formerly understood in spiritual or psychological terms. This trend is documented by Conrad and Schneider in *Deviance and Medicalization: From Badness to Sickness* (1992), and is quickly gaining momentum with each new neuroscience publication purporting to discover the biological basis of some new cognition or emotion through brain imaging technologies, and with every introduction of a novel, ever-more-specific pharmaceutical compound designed to master mind and mood. This trend is not simply a scientific revolution: it is a rhetorical shift characterized by changes in the public vocabulary. Contemporary neuroscience "presents us with a new grammar for understanding our minds" (Johnson, 2004, p. 184). Common ways of speaking about the self are increasingly suffused with neuroscientific terms: serotonin, Prozac, amygdala, and frontal lobes are terms that regularly circulate in public vocabularies (Johnson, 2004). No longer an arcane scientific discussion, brain chemistry and details of refinements in the designer specificity of compounds like Prozac are "the stuff of fashionable coffee table talk" (Healy, 1997, p. 5).

This becoming-public of the grammar of neuroscience is part of popular culture's embrace of biological materialism. This revolution in grammar is not simply a textual shift, or a difference in the ways people speak about themselves; it has material consequences as changes in ways of speaking are accompanied by changes in social practices. When problems such as crime or poor academic performance, for instance, are viewed as medical problems resulting from biological, rather than social or psychological, causes, the response to these problems is more likely to be medical or biological. Conrad and Schneider (1992), for instance, trace the cultural and institutional consequences of viewing problems such as alcoholism, crime, and hyperactivity of children as biological illnesses rather than moral failures or psychological troubles. Certainly, an individual who violates the law will be treated differently if he or she is thought to be sick versus sinful: the insanity defense is just one contemporary example of the ways in which a biological attribution can influence social policy. Conrad and Schneider conclude that medicalization ultimately increases social control by bringing more individuals into the institutional fold: when people are designated as ill, they become obligated to a host of institutional interventions and subjected to the dictates of authorities with technical expertise, losing their freedom in the process.

What Conrad and Schneider do not take into account in their critique of social control are the ways in which the neuroscientific revolution coincides with significant changes in the structure of institutions. The tasks of observation, diagnosis and treatment that were once the sole province of medical authority have become dispersed throughout the social field, and individuals are becoming more and more responsible for carrying out many of these tasks on themselves. These changes are partially evident in the discursive shift, especially pronounced in mental health, from “patients” to “consumers.” Health becomes both right and obligation, a task that the individual takes up in daily practice. This change in the relationship between institutions and practices of control is described by Gilles Deleuze (1995) as a move from disciplinary societies to societies of control. Paul Rabinow (1998) takes up this theme in the specific context of biological interventions, describing contemporary society as a manifestation of “biosociality,” where the dominant form of power is not institutional control but “biopower,” Foucault’s term for a productive power that does not seize the individual from outside but works from within. It is important to note that Rabinow highlights the continuity of disciplinary mechanisms: they are not entirely replaced by mechanisms of control, rather, they continue to exist albeit often with modified function.

When the grammar of neuroscience is taken up in popular discourse in an era characterized by a dispersion of institutional procedures, individuals become increasingly able to—and obligated to—observe and monitor themselves for signs of illness, determine provisional diagnoses and even administer treatment. This trend is accelerated by the explosion of direct-to-consumer advertisements for prescription drugs, discourses that make the public more and more fluent in the language of medical science. Statistical and anecdotal evidence suggests that when patients do visit doctors, they are often already prepared with a specific diagnosis and request for a specific medication. In addition, the emphasis on preventative medicine puts the individual in a position of responsibility for the constant maintenance of his or her health. Health is a state that must be constantly pursued, but it is never achieved as a static resting place. Even when no illness is actually present, one must never let their guard down lest the ever-present but latent threats disrupt the precarious balance of well-being.

Thus, Conrad and Schneider are correct about the increasing medicalization of everyday behaviors, but they mistake its consequences. Although Conrad and Schneider and Bush's Council on Bioethics represent very different sides of the political spectrum, they both approach biotechnology and medicalization as problematic social phenomena. For Conrad and Schneider, medicalization entails a dangerous expansion of social control and associated modes of "normalizing" subjects; for Bush and Council, recent medical techniques threaten the authenticity of human experience, tempting society "to settle for a shallow and shrunken imitation" (2003, p. 270). In this project, I engage this trend of the medicalization of everyday experience through a rhetorical analysis of popular neuroscience discourse. My primary objective is to better understand the ways in which contemporary neuroscience informs the ways in which individuals understand themselves, speak about themselves, and act upon themselves and toward others. Following Michael McGee (1982) and other theorists and practitioners of materialist rhetoric (e.g., Condit, 1999a; DeLuca, 1999a; Greene 1998), I attempt to document the ways in which the grammar of neuroscience moves throughout the public vocabulary, bringing with it specific material practices of subject constitution. An important distinction must be drawn between the rhetorical approach and Conrad and Schneider's critical ideology or Bush's moralism: the materialist rhetorician is first and foremost interested in tracing powerful discursive currents across the social terrain, not judgment of rhetorical acts based on some transcendental, or externally imposed, criteria. Materialist rhetorical analysis is a practice of immanence that seeks both the risks and possibilities that inhabit discursive events.

It is noteworthy that the Council's condemnation of biotechnological therapies replicates traditional charges against rhetoric. The denunciation of biological techniques that go *beyond* therapy suggests that biotechnology should be begrudgingly tolerated if only it remains within its appropriate boundaries and does not attempt to move beyond its curative or restorative function. When biotechnology goes beyond its circumscribed territory, it corrupts the human being, rendering the subject an inauthentic imitation of true human essence. Rhetoric, as the "hand-maiden of philosophy," has been similarly limited by dictates that it remain subservient to Truth. When rhetoric steps outside of its territory, it too becomes imitation and falsehood, the antithesis of everything that is real and authentic. As a rhetorician, I am suspicious of these Platonic echoes in contemporary reactions against biotechnology, especially in the spheres of mental health and illness.

Too often, judgments of neuroscience invoke, implicitly or explicitly, some type of "human nature" and all of the metaphysical baggage such a theory of the human subject carries with it. An important part of this project, then, is to engage neuroscience from a rhetorical perspective that substitutes an ethics of immanence for the politics of judgment. Part of this orientation entails a reflective approach to rhetoric itself, engaging our disciplinary habits and identities as they are formed through our common theoretical and critical practices. I describe this orientation as one of "encounter," where both rhetoric and neuroscience are conceived as interanimating and mutually constitutive bodies in a shared relation of becoming.

In the remainder of this opening chapter, I develop several of these themes I have alluded to in order to better frame the discussions to follow. First, I offer a brief introduction to contemporary neuroscience and its technologies for imaging the brain. I then situate neuroscience within the current social matrix that has been described as the age of "biosociality," or the "society of control." After laying out the general content area that this project engages, I take up the question, "Why should rhetoric care about neuroscience?," describing the rhetorical force of contemporary neuroscience discourses as well as the implications that neuroscientific understandings of the subject have for the rhetorical discipline. I conclude this chapter with a description of my method of text selection and a preview of the remainder of the project.

The Neuroscience Revolution: Imaging the Brain, Seeing the Self

> To grasp the true story of our lives in its entirety, we have to move . . . down to the level of our brains in themselves as they really are. The mind is now open to

> us in ways that exceed the wildest dreams of poets and philosophers. Why not peer inside? (Johnson, 2004, p. 214)

> While the brain is but one organ among many in the human body, it is the source and determiner of everything. Our understanding of the world changes in concert with the evolution of this delicate structure, which is unlike anything in the universe. Indeed, we understand the world the way we do at each of life's stages because of our brain. And yet, until lately, the brain jealously guarded its secrets. Only recently—with the development of powerful new technologies—have we been successful in delving into the secrets of the brain (Restak, 2001b, p. xvi).

The ultimate truth of our lives is no longer high above us or even outside of us in true forms that are only distortedly reflected on the walls of our dark cave. Plato's famous allegory is reversed in almost every way. The truth is not outside of us, but lodged within us. We are not enclosed in a dark interior, it is the truth that awaits us in this hidden core and we must go down to it and bring it into the light where we can see it. And this truth is in no way ideal, it is the wholly material, biological basis of our every experience and our very existence. The above excerpts are representative of modern scientific discourse about the self, a discourse that situates the biological brain as the ultimate referent in discussions of human thought, behavior, identity and experience. Every aspect of human existence, "every nuance of yourself, the very fabric of your experience, ultimately arises from the machinations of your brain," as Steven Quartz and Terrence Sejnowski put it: In short, "The brain houses your humanity" (2002, p. 3).

In this Age of the Brain, we have not only reversed Plato, we have recognized Descartes' error.[1] For Descartes, the world of mind (subjective mental life) and the physical world (objective material reality) comprised two distinct ontological realms that could only interact vaguely through an isolated and poorly understood brain mechanism. Today, monism is the scientific party line, and it holds that the world of the mind is simply an effect, epiphenomena, or illusion produced by material processes located in the brain. The Cartesian error, then, was not just in assuming that the mental was a discrete domain independent of the body, but in attributing epistemological privilege to mental processes. In the Cartesian dictum, it is mental activity that grounds knowledge, particularly knowledge of the self. Our existence is assured and ensured by introspective mental processes characterized by absolute presence and transparence, processes that constitute our self-sameness or identity, and what Derrida calls "the ether of metaphysics." The scientific denunciation of Cartesianism places into doubt the certainty of the self-evident, suggesting that our entire mental existence is but the phantasmic production of biochemical interactions.

Paradoxically, then, at the same time that we come to embody the truth it is most inaccessible, not because it is far from us but because our powers of perception are both constructed and constrained by the very source of this truth. The truth of our identities is not guaranteed through experience, in fact, it is obscured through experience because there is no way to be certain that our lived experience bears any referential or accurate relationship to reality. This experience does not reflect reality, rather, it is mediated by, or caused by, the physiological activity of our brains. In the current scientific narrative, the only way to access this truth, or these causal substrates, is through the agency of science, specifically cognitive neuroscience and its host of brain imaging technologies.

Brain imaging technologies have been described as the “holy grail” of modern neuroscience, and there is almost no fantasy they have not promised to fulfill. Brain imaging enables scientists to determine the spatial and temporal coordinates of specific cognitive tasks. By measuring brain blood flow and metabolism or by assessing the electric and magnetic currents associated with brain activity, brain imaging technologies can visually depict the structure and function of cognitive and sensori-motor tasks.[2] The images produced by these technologies (for instance, CT scans, MRI scans, PET scans, and electroencephalographs, or EEGs, and magnetoencephalographs, or MEGs) have a dual existence. Within science, these images function as graphs, or visual abstractions of digital data. In popular discourses, these images circulate as an epistemically new approach to the brain. In popular representations, brain imaging technologies are widely described as “windows” onto the mind, or technologies that provide unmediated access to the brain, rendering human subjectivity transparent to the scientific gaze.

The neuroscientific revolution and the dominance of biological materialism are indebted to the concurrence of these imaging technologies and the proliferation of psychopharmaceuticals. The images produced by these technologies circulate in popular discourses as legible texts, or photograph-like images with clear meanings that are accessible to public audiences. They accrue their rhetorical force not only from their scientific authority but because they appear to be intelligible images that practically anyone can read and understand, even without the benefit of expert scientific guidance. In popular discourses, these images circulate as depictions of the neural correlates, or biological substrates, of a host of different activities, moods and thoughts. Because contemporary brain images are noninvasive, they can be used to produce visual depictions to accompany virtually any subjective state. Thus, the images are deployed as evidence of the biological basis of any and every emotion, cognition and behavior.[3] Pharmaceuticals have a similar function in the entrenchment of biological materialism: as more and more psychotherapeutic drugs are developed, the ability for these drugs to change thoughts, moods and behaviors is articulated as evidence of the biological nature of these subjective processes.

In this project, I am primarily concerned with popular accounts of brain imaging technologies and, more generally, popular renderings of neuroscience. My goal is to understand how these discourses of biological materialism articulate "the subject," and my premise is that contemporary brain rhetoric is part of a significant shift in the way we view human nature and identity. By interrogating popular discourse on brain science, my task is to determine precisely what this shift entails. This is a question with significant material consequences. The neuroscientific revolution does not simply change the way that the subject is defined through verbal discourse or even visual texts. This revolution enables a host of "technologies of the self," in Foucault's (1988) terms, or material practices for constructing subjectivity that are enacted by, or carried out by, actual individuals in their everyday lives. These technologies play out in a variety of different social arenas, from childcare and education to criminal rehabilitation and the treatment of mental illness.

Contemporary brain science is not an arcane scientific field or an isolated discourse that only wields influence in health care settings. Biological materialism is a cultural phenomenon that goes well beyond the scientific evidence (Healy, 1997; Kramer, 1993). The brain theories that comprise this biological materialism might partially originate in scientific discourse, but they gain rhetorical force when they come to inhabit public vocabularies. The becoming-public of the grammar of neuroscience is accompanied by, and caught up in, new therapeutic paradigms and practices specific to modern neuroscience. The quintessential Freudian model of analysand recumbent on the sofa speaking to the vigilantly hermeneutic analyst is replaced by the model of an active consumer-patient ingesting chemical compounds that exert increasingly specific effects on brain biochemistry. Even if we are not philosophers who spend time speculating about the promises and pitfalls of Cartesianism and its alternatives, our everyday understandings are very much informed by the prominent philosophical and scientific worldview that holds that the only reality is physical, and mental or psychological constructs and events result solely from this material substrate.

Biosociality and the Neuroscientific Subject

In recent decades, and especially in the 1990s, declared the "Decade of the Brain" by act of Congress and President, there has been substantial attention to all things cerebral. This attention is not isolated to science or even academia, but is witnessed in the proliferation of conversations about the brain that circulate in public culture. The brain and images of the brain permeate a wide array of seemingly disparate *topoi*, or conversations. From parenting to mental health, gender identity to Alzheimer's disease, and religion to crime, brain imaging is a critical reference. On the surface, these brain discourses seem to embody a paradox. On the one hand, contemporary neuroscience is steeped in biological determinism, and the biological brain is defined as the ultimate referent for the entirety of human subjectivity. On the other hand, however, the access enabled by imaging technologies is accompanied by practical interventions that promise humans complete control over their biological composition and, ultimately, their identities. My project is to engage this paradox, not as a logical contradiction, but as the framework for particular modes or practices of subjectivity, including ways of attending to and constituting the self—what Michel Foucault and Gilles Deleuze refer to as processes of "subjectivation," or technologies of the self.

The subject positions enabled through neuroscience are more broadly conceived as products of "biopower," a specific exercise of productive power particular to the contemporary epoch. Michael Hardt and Antonio Negri describe biopower as "a form of power that regulates social life from its interior, following it, interpreting it, absorbing it, rearticulating it. Power can achieve an effective command over the entire life of the population only when it becomes an integral, vital function that every individual embraces and reactivates of his or her own accord" (2000, p. 23-4). Biopower extends both across the entirety of social relations and through the depths and consciousnesses of individual bodies. Biopower is conceived as a type of power unique to societies of control, the contemporary social manifestation marked by a breakdown of institutional sites of power and a dispersal of technologies of subjectivation across the social field. Hardt and Negri characterize the society of control as that society "in which mechanisms of command become ever more 'democratic,' ever more immanent to the social field, distributed throughout the brains and bodies of the citizens" (23). The practices of regulating subjects become taken up by individuals and interiorized, no longer exercised over them by clearly demarcated institutions, but instead taken up as practices of daily living. This democratization of command mechanisms can be seen, for instance, in the shift from describing individuals seeking psychiatric treatment as “patients” to “consumers.” Treatment becomes a “right,” and the active pursuit of treatment is figured as an avenue of empowerment.

In the brain science discourses, practices for attending to and altering the self are not isolated to scientific or medical interventions, but instead include a wide array of daily habits and procedures that are dispersed throughout society. Individuals are defined as wholly biological creatures, determined in every way by brain physiology, but this physiology is simultaneously articulated as “plastic,” and immediately affected by even the most mundane cultural events and interactions, including each thought, mood and behavior of the individual. Paul Rabinow (1998) describes this phenomenon as “biosociality,” where nature is modeled on culture understood as practice: “Nature will be known and remade through technique and will finally become artificial, just as culture becomes natural” (p. 411). In short, the distinction between nature and culture is blurred and breaks down—or, in other words, the nature/culture opposition is no longer a legible framework for understanding contemporary society. Everything becomes “natural,” because biology is the origin of every event and the outcome of every event. The nature/culture opposition, as it is conventionally figured, allows for some relation of causality between the two: either nature causes (determines) culture, or culture causes (constructs) nature. When biology is both origin and outcome, these causal relations are no longer possible and the opposition itself becomes unsustainable.

Biosociality is characteristic of societies of control, or what Rabinow calls postdisciplinary society. This society is defined by two characteristics: First, prevention replaces traditional therapeutic interventions, accompanied by an emphasis on administrative management and risk calculation. Second, as technologies of subjectivation are dispersed throughout the social body, there is "the promotion of working on oneself in a continuous fashion so as to produce an efficient and adaptable subject" (Rabinow, 1998, p. 412). Practices of subjectivation become the responsibility of individuals as the "self" becomes a continuous task or obligation. The emphasis on prevention is critical to this never-ending obligation: even if, in the case of medicine, there is no illness actually present, there is still a ceaseless imperative to monitor oneself for signs of emergent illness and to take measures to prevent the possibility of illness. Health becomes a task that is articulated as both freedom and obligation whereby the individual is responsible for scrutinizing himself or herself and taking active measures to subvert looming threats to the delicate balance that defines the healthy state.

A specific type of subject is produced via biopower, or biosociality. When productive power procedures are dispersed outside of concrete institutional locales (the defining hallmark of a shift from the disciplinary society to a society of control), there is a corollary shift in model of subject from "mode" to "modulation." Deleuze explains, "Confinements are *molds*, different moldings, while controls are a *modulation*, like a self-transmuting molding continually changing from one moment to the next, or like a sieve whose mesh varies from one point to the next" (1995, p. 178-9). He gives the example of school, a confinement, replaced by continuing education, exams replaced with continuous assessment. In a society of molds and confinements, the individual is always moving from one locale of power to another, always starting anew. With modulation, the subject is obligated to take up his own production as a never-ending task, crafting his "self" as a work in progress that never reaches completion. In contemporary neuroscience, health is defined less as a stable state than an elusive balance both within the individual and between the individual and his or her environment. There is no moment of completion or stasis where "health" is attained: instead, health is modulation, a continuous quest for the optimal combination of internal and external elements. A major distinction between "mold" and "modulation" concerns the location of practices of subjectivation. In a disciplinary society, these practices are located in specific institutions. The hospital, for instance, is a space that contains a specific set of technologies for constituting subjects (for instance, diagnosis and treatment of illness). When the individual has been diagnosed and treated, they might move to the school, where they will be trained and educated. In a postdisciplinary society, these practices become dispersed outside of institutional locales. Each individual becomes responsible for his or her own diagnosis, treatment, training and education, and these tasks must be taken up as ongoing practices of daily living.

Rabinow (1998) isolates several key consequences of the shift from mode to modulation in practices of subjectivation: first is the emphasis on prevention as an ongoing process of surveillance. It is not the individual who is surveilled, however, but "likely occurrences of disease, abnormalities, deviant behavior to be minimized and healthy behavior to be maximized" (p. 412). Individuals are not constructed as "deviant" and then subjected to institutional correction—this is the mode of a disciplinary society. With control, the concepts of "normal" and "deviant," or sick, are replaced with "the technocratic administration of differences," where it is not who one is but what one does that puts one at risk (p. 412). The result is that individuals are called to constantly scrutinize themselves, attending to their daily practices in a never-ending search for emergent risks.

Normalization becomes an endless series of corrections, a constant stream of alterations. The concept of "normal" is no longer a determinate state, but something like a vanishing horizon that the individual is always working toward, but can never actually achieve. Normalization is an endless procedure that entails constant self-scrutiny, diagnosis, and corrective intervention.

The irruption of the categories of normal and pathological also entails an explosion of, or rearticulation of, the categories of nature and culture. Rabinow (1998) writes that one consequence of biosociality is the disappearance of the category of "culture," or the social. The opposition between nature and culture that purportedly secures their identities in diacritical fashion no longer functions in the same manner. Nature becomes, Rabinow writes, "a blind *bricoleur*, an elementary logic of combinations, yielding an infinity of potential differences" (p. 416). There is no clear demarcation between the natural individual and the cultural subject: cultural elements are just as biological as natural elements, because both construct the subject from moment to moment as the contingent effect of their combinations. In the brain sciences, for instance, even though biological psychiatry and its cornucopia of pharmaceutical cures is heralded as the victorious successor of psychology, talk therapy has not been abandoned. Instead, talk therapy is redefined as a biological treatment because words affect the biology of the brain just as drugs affect the biology of the brain. All types of social interactions and individual thoughts and emotions are assimilated into "nature," articulated at the level of their biological effects. Nature, in these discourses, functions not as the diacritical counterpart of culture, but as a "plane of immanence" or "plane of consistency" (Deleuze, 1988a). A plane of immanence suggests a horizontal configuration where diverse elements congregate, entering into dynamic combinations to produce the contingent effects that are taken to be subjects or objects. The planar figure situates all elements as *consistent*, or ontologically similar: none can serve as causal agent, or metaphysical subject that commands ontological priority. Rather, all are situated equally and the causal relation is removed from a certain type of element (material, ideal) and distributed as an immanent causality.

The figure of DNA, the double helix, is used to describe this function of nature as *bricoleur*, not engineer, of the subject. This topology has several implications. First, DNA functions according to a combinatorial logic. In Rabinow's example, an infinity of beings can arise from the seemingly limitless combinatorial possibilities of the four building blocks of DNA. Second, the structure of DNA provides a dynamic model of contemporary modulations of subjectivation. Deleuze (1988b) uses the double helix model to describe the contemporary form of subjectivation as "superfold," following Foucault's (1970) discussion of the fold as the modern figure of man. Foucault describes the fold as the subject turning back on itself, an affect of self by self, or folded force. In *The Order of Things*, the fold is figured as the empirico-transcendental doublet that results from "man" becoming both subject and object of knowledge (Foucault, 1970). The double helix model, or the superfold, puts this model in motion, suggesting a figure that turns back on itself in endless reflexivity. There is a constant self-interrogation that is accompanied by ceaseless self-transformation: knowledge of the self is always in order to change the self. The superfold also proceeds by bringing new elements into its foldings, entering into relations with forces external to the subject in such a way that any neat division between interiority and exteriority becomes impossible. Causality becomes immanent, as power does not emit from a unitary subject acting on his or her world, nor does it come to constitute the subject from the outside. Instead, the elements that comprise the subject from moment to moment are smeared out on a surface, or a plane of consistency, and their combinations cannot be traced to any single determining factor. The superfold, then, is defined by a combinatorial entwining of diverse elements that functions according to an immanent causality. As a mode of subjectivation, the superfold points to the constant attention to and practice on oneself, a never-ending turning back on oneself in ceaseless reflexivity.

The model of the "superfold" for understanding contemporary processes of subjectivation shares an emphasis on networks, planes, and combinatorial logic that permeates social theory. Hardt and Negri (2004) draw attention to the "distributed network" as a model for political organization and communication technologies, a thoroughly biopolitical form of organization that is not limited to the individual human subject. They write, "In contrast to the transcendental model that poses a unitary sovereign subject standing above society, biopolitical social organization begins to appear absolutely immanent, where all the elements interact on the same plane" (2004, p. 337). An external authority is not imposed from without, rather, the various elements constitute social organization themselves. Hardt and Negri recognize that the physical body has long been used as a metaphor for the social body, and they continue this tradition by borrowing from the insights of contemporary neuroscience, where "the human body is itself a multitude organized on a plane of immanence," and not a Cartesian entity with a sovereign "mind" that imposes its will on the body through intentional commands (2004, p. 337). Rabinow writes that contemporary biology is not simply a metaphor for social organization, but instead "a circulation network of identity terms and restriction loci, around which and through which a truly new type of autoproduction will emerge," what he calls biosociality (1998, p. 411).

These authors who describe these new forms of social and individual regulation have in common a certain ethical or political orientation that this project shares. This orientation might be characterized as one of hope, in contradistinction to nostalgia or regret for the disappearance of "man" and the conventional forms of political resistance that accompany "him." A critical aspect of my engagement of neuroscience is an orientation that seeks to treat this discourse as a potential contributor to productive rhetorical theories and, more generally, promising accounts of political action. This orientation can be distinguished from two alternatives. First, within rhetorical studies, there is a tendency to treat science as an undesirable "Other" that embodies everything the rhetorician disdains: claims to objectivity, freedom from linguistic ornamentation, and an overconfident epistemology. In critical discourse more generally, science is usually called out on account of its determinist theories that eschew individual and collective agency, a prerequisite for beneficial social change, and the relation of mastery and control it constructs between a masculinist scientific agency and a passive, feminized nature. I want to trouble these ubiquitous criticisms and suggest that instead of taking positions against neuroscience, neuroscience is a productive reservoir for both rhetorical theory and criticism specifically and progressive social theory and practice in general.

In the next section of this chapter, I turn to the question: Why should rhetoricians be concerned with neuroscience and brain imaging? I answer this question by describing the *force* of contemporary brain science in terms of its cultural, material and theoretical effects. In this discussion of the force of brain science, I situate my project in relation to other critical studies of medical imaging and neuroscience. Thus, I will ultimately answer two questions: First, why should rhetoric care about neuroscience? And, second, what does a specifically rhetorical perspective bring to the scholarship on neuroscience and brain imaging? Neuroscience is a powerful social discourse, and it is a productive place to analyze the function of scientific argument in the public context of our biosocial era.

Why Should Rhetoric Care About Brain Science?

The neuroscience “revolution” is both discursive and technological: It represents a proliferation of biological vocabularies to talk about virtually every aspect of human experience and identity, as well as the growth of technologies that promise unmediated access to the living brain. This revolution is not simply a medical but a *cultural* phenomenon that elicits significant public attention. As evidenced by former president George Bush’s 1989 declaration that the 1990s would be the “Decade of the Brain,” it is not just scientists who are interested in everything cerebral.[4] Neuroscience and brain imaging can be traced through a host of public conversations, from the Tom Cruise v. Brooke Shields controversy to Tipper Gore’s efforts to “destigmatize” mental illness to the ubiquity of Prozac as cultural icon. Colorful pictures produced by brain imaging technologies populate *Time* and *Newsweek* as well as a panoply of advertisements for various and sundry products. Terms like “serotonin” and “post-traumatic stress disorder” have become part of our common language, no longer isolated to medical textbooks or pristine laboratories. The symbiotic relationship between medical technologies that visualize the body and culture is not born with contemporary brain imaging. There are several notable scholarly documentations that highlight this symbiosis as a variable yet persistent historical thematic.

Anne Beaulieu (2001; 2002) is one of the most prolific scholars of the cultural and sociological impact of brain science, both in the popular arena and within the scientific community. She has examined the ways in which brain scan images are deployed in popular media discourses. Brain images lend an ethos of concrete authority to biological explanations of individuals: “Popular narratives about brain mapping are shaping expectations about the increased ability of neuroscience to finally explain ourselves biologically, via the powerful objectivity of technology” (2000, p. 49). The images function as visual arguments, photographs that depict objective reality without the intrusion of human bias (2000, p. 45). Brain scans are frequently described in terms such as hot/cold, light/dark, or bright/dim, and often these descriptions are contextualized in such a way that it appears as if the brain itself emits these qualities. Beaulieu concludes that the rhetorical use of these images in popular settings is part of a larger trend of medicalization and biological reductionism, the consequences of which have not yet been determined.

In *Picturing Personhood* (2004), Joseph Dumit comes to similar conclusions about the deployment of brain images in popular forums. Dumit examines the depiction of positron emission tomography (PET) images in popular discourses, and he also offers an ethnography of neuroscientific practice, allowing him to compare and contrast the scientific and popular understandings of brain images. Like Beaulieu, Dumit finds that the cultural force of brain images goes far beyond their scientific applications. However, he also highlights the fact that the two sets of discourses rely on many of the same tropes and framing devices, indicating their mutual influence and shared patterns of circulation. Dumit describes the vast social effects of this circulation, from their alteration of legal proceedings to the ways in which they affect public vocabularies about the self. Jose van Dijck also writes of the social implications of brain imaging in *The Transparent Body* (2005), arguing that the ubiquity of these images in the popular media tempts us to believe that we can understand their medical meanings. Not only do imaging technologies purport to render the body transparent, but also the images themselves are often read as if their meanings are transparent to their observers. This apparently legibility enhances the rhetorical force of brain scan images, enabling them to function as argument and evidence in popular discourses.

This cultural force of scientific technologies is not specific to brain imaging and neuroscience, but is instead part of an historical pattern in which medical science and culture wield a mutual influence. In her examination of the relationship between medical imaging and cinema, Lisa Cartwright (1995) emphasizes that medical imaging has always been not merely a technical but an important social phenomenon. The way that the body is constructed and situated in medical discourse influences, and is influenced by, cultural representations of the body and bodily practices. In her history of medical imaging, Bettyann Kevles (1997) similarly attends to the social implications of medical imaging technologies. The development of X-rays, for instance, fundamentally challenged traditional conceptions of privacy, shifting social and moral boundaries by marking what was once inaccessible visible. She writes, “From pulp fiction to the fine arts, writers, artists and movie-makers played exuberantly with the idea of seeing through bodies with invisible rays, of looking for secrets beneath the surface” (1997, p. 4). Kevles traces the influence of these technologies of visibility through the courtroom, popular culture and medicine, illustrating the unpredictable effects technological innovations have outside of their primary fields of application.

As a powerful cultural current, neuroscience discourse exerts a material force, changing the social landscape and substantially affecting the ways in which individuals act to manage and control their identities, moods and behaviors. As the “holy grail” of contemporary neuroscience and a considerable impetus for the biological revolution in psychiatry, brain images are used as evidence of the material basis of all behaviors, including what are categorized as symptoms of mental disorder. Although brain imaging does not actually have any diagnostic applications, the images circulate as clear evidence of the biological nature of mental illness. This understanding has enormous material consequences, as biological illness is more likely to be treated with medications than a condition viewed as psychological, or the product of “intangibles,” such as the unconscious or repressed memories. Recent statistics from the American Psychiatric Association indicate that over 20% of American adults has a diagnosable mental illness during any one year period, and the National Institute of Mental Health estimate a 22% incidence rate in mental illness for American adults (2005). The vast majority of those diagnosed with a mental illness are prescribed some form of psychiatric medication. Further, it is not just the ill who are turning to medication: the biological revolution has also introduced the possibility of using medication to become “better than well,” sometimes described as cosmetic pharmacology or the consumption of “lifestyle drugs” (see Chatterjee, 2004: Kramer, 1993).

Sander Gilman, who has published a substantial body of work addressing the relationship between mental illness, visual representations of madness, and the construction of individual and collective identity, argues that representations of mental illness are constructed in order to clearly demarcate normal, healthy individuals from the sick (1988, 1995). Individuals secure their own “normal” identity by projecting their fears of disorder and disintegration onto the mad “Other” through techniques of visualization. Today, however, this explanation does not seem to fit. Mental health is increasingly articulated in terms that situate the “patient” as an active and empowered agent. Patients are described as “consumers,” and seeking out medical attention for a suspected disorder or imbalance is both courageous and empowering: mental health is a right, and each individual is responsible for its active pursuit. The American Psychiatric Association recently released the results of their Consumer Survey on Mental Health Issues, finding that nearly 90% of American adults “agree that people with mental illnesses lead healthy lives,” and a vast majority also believe that seeking out medical attention is a sign of strength (American Psychiatric Association, 2005). The recent backlash against Tom Cruise’s critique of medical psychiatry is further evidence that far from being the projected “Other,” mental illness is not only accepted but is actively defended. A host of public figures have come forward with their stories of mental illness, including Tipper Gore and Brooke Shields. The material force of brain images is not isolated to psychiatry and mental health. These images are widely deployed in a variety of settings, ranging from child development to medicine to crime and rehabilitation. In one chapter of this project, for instance, I examine the ways in which brain images have concrete effects on practices of parenting and educating children. Just as brain images have a wide-ranging cultural force that extends beyond their scientific and technical applications, the material force of the neuroscience discourses ripples throughout many diverse domains of society.

Medical imaging technologies in general change the way that we think about and consequently act upon bodies. Cartwright (1995) argues that the emergence of biology in the nineteenth century entailed the development of a new mode of representation in science. The emergence of imaging technologies, including X-rays and microscopes, was a scientific and cultural mode of representation with profound material effects, "a mode geared to the temporal and spatial decomposition and reconfiguration of bodies as dynamic fields of action in need of regulation and control" (p. xi). Catherine Waldby (2000a, 2000b) offers a more contemporary analysis in her work on the Visible Human Project (VHP), the construction of a virtual anatomy "atlas" in a project that creates comprehensive, three-dimensional representations of male and female anatomy and makes these available on the internet. The project is designed for educational purposes and as a standard referent to visually mark "normal" bodies in order to provide a stable way of diagnosing pathology. The VHP constructs the body through digital codes, leading Waldby to conclude: "Its limitless capacity to decompose and recompose the virtual corpse lends it to biomedical fantasizing about human life, and Life in general, as an informational economy which can be animated, reproduced, written and rewritten, through biomedical arrangement" (p. 2000a, p. 37). When the body is rendered as digital code, it is articulated as subject to the same manipulations and reconfigurations as digital data. New techniques for visualizing the body and manipulating it as informational economy result in produce significant material consequences. She writes, "While understanding the human body as database or information archive may be metaphorical at one level, at another this mode of understanding produces material practices that work the body as database" (2000b, p. 39). Like Cartwright, Waldby emphasizes that different modes of visualizing of the body change both the way we think about the category "human" and material practices of engaging the body.

Engaging Rhetorical Formations: Text Selection

In short, the popular uptake of neuroscientific discourse makes a clear demarcation of a body of rhetoric impossible. I engage this discourse, or set of discourses, as what Celeste Condit has termed a "rhetorical formation" (1999a). By her definition, a rhetorical formation is multiple, contested, and dynamic. Rhetorical formations are multiple because they comprise combinations of different types of rhetorical elements. The model of rhetorical formations is an alternative to "single speech" or "single text" models of rhetorical criticism that assume that a rhetorical act can be neatly isolated and divorced from its context. Instead, rhetorical texts are understood as "focal nodes in a larger torrent of human discourse" (Condit, 1999a, p. 250). Second, even when particular rhetorical frameworks are popular or dominant, they are never determinant. They do not command, they persuade, which means that they are always contested and open to challenge or negotiation. Finally, rhetorical formations are dynamic: because they are comprised of constantly shifting patterns, they do not stay the same. This model is extremely valuable for my purposes, because I view the brain science discourses as a nodal point in larger discursive flows associated with biological materialism. There is no single text that instantiates this rhetorical configuration, rather, it is the product of an array of discourses that circulate throughout diverse conversations. Additionally, the brain discourses and their corollary practices are not the result of top-down commands from the lofty sphere of science. These discourses are extremely persuasive, and they are partially constructed through the active participation of public "audiences." Finally, the brain imaging rhetoric exhibits both synchronic and diachronic variation: it is possible to identify common patterns and persistent tropes, but it is impossible to pin down *a* discourse or *a* text.

This project emerges from a larger, ongoing interest in the relationship between imagery, scientific rhetoric, and the constitution of the "self." While working on this project, I have tracked down, pored over, and scrutinized a wide range of texts, from popular magazine and newspaper articles to documentary films, from nonprofit websites to popular fiction to self-help books to public speeches by politicians. Included in the texts I focus on are magazine articles from popular publications (primarily *Time* and *Newsweek*), books written by both scientists and journalists for popular or mixed (scientific and popular) audiences, and speeches given at government-sponsored conferences. In each case study, I further specify the selection of focal texts. I attend to both the verbal discussions of brain imaging, but I also emphasize the visual features of this rhetorical formation, in particular, the brain images, but also the pictures and diagrams that accompany these images. In the remainder of this introductory chapter, I summarize my theoretical orientation toward brain images as a prominent feature of these texts, providing some background regarding the production of these images. I conclude with a brief preview of the remainder of the project.

What Are We Looking at Anyway? The Rhetorical Force of Images

This project is as much about the ways in which people talk about brain imaging as the images themselves. Functional brain imaging often circulates as a miraculous technological breakthrough that allows medical experts and brain scientists to determine the basis an individual's moods, thoughts and behaviors, classifying individuals into the appropriate diagnostic category with visualization techniques that bypass the hermeneutics of analysis and directly access the biochemical origins of personality.[5] In actual practice, however, this is not the case. In short, while functional brain imaging has discursively supported psychiatry's development from a "quasi-science" into a thoroughly biological, material science, in practice, functional brain imaging has little to no diagnostic application. As Benedict Carey reports, over 500 brain imaging studies are published each year, but the technology is "oversold" as a diagnostic tool (2005). Although some psychiatric practitioners sell brain scans as a crucial diagnostic tool, the expert consensus is that the imaging technology has no diagnostic application in psychiatry. Brain imaging can reveal brain tumors or gross structural abnormalities, but its functional applications currently have no diagnostic utility.

The brain imaging studies that purport to reveal differences between men's and women's brains, or the brains of depressed individuals versus healthy individuals, are averages of a collection of images from different subjects. Because brain images are not photographs but computer reconstructions of abstract data, averaging techniques are used as ways to eliminate "noise" and compensate for individual variation. Individual brains vary widely, and there is no "standard" brain that can anchor interpretations of difference or deviance. If scans from women are averaged, and the average is compared to the average of data obtained from men's brains, a difference might be found. This does not mean, of course, that the brain of an individual woman will function anything like the "average" that is produced from the data set. Image averaging is employed to eliminate “idiosyncratic differences,” as Posner and Raichle explain: “In order to accomplish image averaging successfully across a group of subjects, it is necessary for sophisticated computer algorithms to manipulate the size and shape of the original subtraction images to conform to those of a standard brain” (1994, p. 64). One consequence of image averaging is that “information about specific differences among individuals is lost” (p. 66). Nancy Andreasen explains, “All the data marshaled to date from imaging and electrophysiology are group comparisons. Groups of people with a particular diagnosis are compared to healthy volunteers, and group differences are found” (2001, p. 159). Thus, “these studies cannot make any specific predictions about an individual,” and they are not useful as screening or diagnostic tests (p. 159). Brain imaging remains an important research tool, but despite the enthusiasm, it has not resulted in the types of applications that are often anticipated and prematurely celebrated in both scientific and popular accounts of the neuroscience revolution.

As stated above, the disjunct between the “reality” and “rhetoric” of brain imaging is not the focus of this project. I am less interested in what the brain images “really mean,” if such a determination were possible, and more interested in what they do, or how they function discursively. Just because brain images do not have diagnostic capabilities does not mean that they are not used in psychiatric practice. Daniel Amen, for instance, regularly orders brain scans for his patients. In his books and articles, he argues that the images help him to convince his patients that the source of their troubles is biological, and can be treated through drug therapy or other means. He states, “They increase compliance with treatment and decrease shame and guilt,” (quoted in Carey, 2005). Outside of scientific research, then, the primary function of brain images is *rhetorical*: they are persuasive devices that are used to construct individuals' understanding of themselves by attributing certain experiences to "biology," or illness, and responding with treatment instead of shame or guilt. They become inventional resources in a rhetorical shift from "moral" attributions to "biological" attributions.

Throughout this project, then, I am interested in something close to what Cara Finnegan has termed "image vernaculars," the visual skills and habits that shape the consumption and circulation of images (2005). The term "vernacular" suggests an unofficial, colloquial mode of communication, however, it is a suitable descriptor of the combination of popular and scientific discourses I engage. When writing for public or mixed audiences, even scientists speak of brain images as magical "windows" that reveal the truths of individual identities. The question is not, "What do these images really show us?," but rather, "What do these images do for us? How are they talked about?" A focus on how the images are talked about by no means elides the emphasis on material social change that informs this project. The ways that we talk about the images, the ways in which they are taken up in public communication, have far-reaching material effects. As the example from Amen illustrates, the understanding that brain images readily reveal pathological substrates in individual cases has material consequences (the ingestion of psychiatric medications, for instance). An attention to the rhetorical force of images demands consideration of the ways in which they are taken up in discourses that address publics, the work that they do rather than their purported deceptions or revelations.

Preview

In Chapter Two, I offer a brief history and background of contemporary neuroscience and brain imaging. There are many good histories of neuroscience, and I do not attempt to replicate these projects here. Instead, I discuss three important moments in the history of neuroscience, not to provide an exhaustive genealogy but rather to put into relief the characteristics of contemporary neuroscience that comprise its singularity. This chapter illustrates the utility of articulation theory as a critical orientation by examining the different ways mind and matter, or culture and nature, have been figured, or arranged, throughout distinct historical contexts. Articulation theory insists that the very distinctions between oppositions such as culture and nature, subject and object, mind and matter, are not false but, rather, articulated through everyday discourses and practices. This means that the oppositions are contingent and dynamic, so that what is considered to be a part of "nature" or "culture" is never completely determined. By looking at different configurations of mind and matter throughout history, specifically as these configurations are conceived through various arrangements of "mind" and "brain," I situate my project as a "history of the present," in Foucault's terms. In other words, by contextualizing contemporary brain science within the variable historical arrangements of mind and matter, it throws into relief the singularity, or contingent and particular qualities, of our current social beliefs about nature and human identity. Thus, ultimately, this chapter is designed to highlight the singularity of contemporary neuroscience and functional brain imaging. It also serves to familiarize readers with some of the major reference points and controversies that inform today's development of neuroscience.

After this historical background, I offer three case studies of contemporary brain science discourses. If articulation is the term I use to situate my theoretical premise that nature and culture are contingent and historically-conditioned discursive configurations, then the biosocial, a category I borrow from Rabinow, is the term that describes the contemporary arrangement of natural and cultural elements. I argue that biosociality is characterized by specific rhetorical consequences, and the case studies are designed to examine these consequences. These case studies move through three different tiers or levels, examining the discourse of biosociality at the level of the individual constitution of identity through a study of self-help books, the social level of parenting and educational practices through an analysis of popular news magazines, and the level of government policy through an analysis of the public address of national leaders.

In Chapter Three, the first case study, I examine a brain-based self-help book, arguing that neuroscience discourse exhibits the characteristics of Foucault's "technologies of the self," constituting a mode of knowledge and correction aimed at transforming the self. Technologies of the self can be understood as vocabularies that condition individuals to decipher themselves in specific ways. Discerning the technologies of the self that are specific to a rhetorical or discursive formation involves considering how the imperative to "know oneself" is made concrete. In the biosocial epoch, biological categories become the privileged means of deciphering one's experience and knowing oneself. These vocabularies have specific, material consequences regarding the way one acts toward oneself and toward others. Biological discourses are not confined to expert realms such as medicine or "Science": they become "science," following Latour's (2004) distinction between "Science" and "science," and distributed throughout the social body for uptake by all individuals. If "Science" and "science" are understood as two different types of discourse, "science" is less a discourse of expertise grounded in the authority of Nature, and instead an accessible vocabulary that infuses all aspects of society.

Chapter Four is the second case study, and it uses Foucault's concept of governmentality to explore the social functions of biosocial discourse. Specifically, I interrogate the ways in which brain images are used to "enfold" authority through the distribution of specific procedures for caring for others. The baby's brain becomes thematized through imaging technologies as a space of attention for social actors, including parents and caretakers as well as educators and physicians. These social actors become responsible for the constant monitoring and intervention needed to "build" successful babies' brains, and hence successful social actors. The practices of caring for others require a great deal of attention to the self, interiorizing disciplinary practices that were formerly exercised in clearly demarcated institutions.

Chapter Five is the final case study, and it continues the discussion of babies' brains by examining the public controversies surrounding the brain imaging research. Neuroscience, informed by brain imaging studies, becomes a powerful source of public argument in debates over child education, welfare, and family leave policies. I focus on the ways in which brain science becomes a normative backdrop for policy arguments through an analysis of a speech by Hillary Clinton and a speech by Laura Bush. Both speeches were keynote addresses at conferences hosted by the White House (1997 and 2001, respectively) to bring brain science research into the policy sphere. After analyzing these speeches to illustrate how brain science infuses policy discourse, I examine the controversy over the importance of the "first three years" theory of child development and its public policy outcomes. I find that in the biosocial context, the function of scientific argument is transformed. Because nature and culture are both articulated through biological vocabularies in this context, science becomes the authorizing discourse for all sides in the controversy. This is not new: what is, however, unique to the biosocial discourse is that the “truth function” of science becomes responsible for the social consequences of scientific research.

These three case studies can be viewed as complementary, each pursuing the same general theme of analysis at three different “levels”: the individual, the social sphere, and national public policy. These three levels overlap in all sorts of messy ways, and this rubric is simply a heuristic device, by no means a blueprint for this project. The general theme is that biosociality has important rhetorical consequences that influence many different areas of our daily existence. By attending to the public circulation of neuroscience and brain imaging, I hope to identify these consequences through concrete and empirical studies. In Chapter Six, I conclude by revisiting the implications of a rhetoric-neuroscience encounter. In this chapter, I explicitly consider the questions of ethics and politics, themes that function as a background murmur throughout the case studies. If, as I have suggested in the introduction, biosociality blurs the distinctions between nature and culture in such a way as to make critiques of “medicalization” or “biological determinism” naïve if not illegible, what are alternatives to dogmatic opposition or uncritical acceptance of these discursive shifts?

CHAPTER TWO

VISIONS OF THE NEW BRAIN: HISTORICAL ARTICULATIONS OF MIND AND MATTER

> The Old Brain was remote and mysterious, deeply hidden within the skull and inaccessible except to specialists daring enough to pierce its three protective layers. Thanks to that inaccessibility and the risks involved in plumbing its depths, brain experts knew little about the functioning of the normal brain; they certainly searched in vain for answers to such fascinating questions such as, "How is the brain related to our everyday thoughts, emotions, and behavior?"
>
> The New Brain, in contrast, does not require dangerous intrusions but can now be depicted using sophisticated computer-driven imaging techniques with abbreviated names like CAT, PET, MRI and MRA. These techniques reveal exquisitely subtle operational details and provide windows through which neuroscientists (brain scientists) can view different aspects of brain functioning without opening the skull or performing other risky procedures (Restak, 2003, p. 3).

Richard Restak's vivid contrast between the Old Brain and the New Brain is representative of a revolutionary discourse sweeping the biological sciences. The "neuroscience revolution," according to George Edelman (1995), is nothing less than a second Enlightenment capable of making good on the promises of the first. Nancy Andreasen (2001) describes this era as a "golden age," where answers to age-old questions about human nature are finally coming to light (p. 7). For the past few decades, "medicine has focused with almost preternatural intensity" on a single organ, the brain, and neuroscience constitutes one of the fastest growing areas of biotechnology, spurred by advances in pharmaceutical treatments and imaging technologies (Stafford, 1996, p. 131). Restak's description points to the significance of these technologies for the neuroscientific revolution: One consequence of the ability to visually depict the brain noninvasively is that the brain becomes an important reference for everyday thoughts, emotions and behaviors. Functional brain imaging allows scientists to visually depict the neural correlates of virtually every human activity, and the resulting images function as evidence of the biological substrates for these experiences.

This discourse of the New Brain is part and parcel of a relatively new field of study, termed "cognitive neuroscience." Cognitive neuroscience is less a completely novel field of study than the recently recognized amalgamation of cognitive psychology, neuroscience and other related disciplines.[6] Cognitive neuroscience is an umbrella designation, "a rapidly expanding domain of biological research comprising all scientific disciplines involved in the study of brain and behavior" (Orban and Singer, 1991, p. 1). Cognitive neuroscience is the attempt to understand the mind, or mental processes, by studying the structure and function of the brain. At the heart of this endeavor is the conviction that mental processes are the product of biological processes in the brain, and that the former can be accessed via the latter. William Uttal describes this as "the modern expression of an extreme monistic ontology" (2001, p. 5), and Elizabeth Wilson similarly situates cognitive neuroscience, with its commitment to the belief that the brain is the final referent for all of human behavior and identity, as an antimetaphysical scientific psychology (1998), or what Thomas Polger and Owen Flanagan prefer to describe as metaphysical naturalism (1999).

If cognitive neuroscience represents a merger between the sciences of the mind and the sciences of the brain, then the bridge that solders these together is functional brain imaging. In the above description, Restak describes functional imaging technologies as "windows" that allow scientists to view the brain directly, allowing unhindered access to the mind. This characterization of imaging technologies as "windows" is common in both popular and scientific discussions of brain mapping. The implication is that these technologies provide a means of accessing the brain/mind that is both transparent and noninvasive. The "windows" metaphor is often used in conjunction with descriptions of imaging technologies as a type of espionage, where scientists can spy on the brain without the brain's knowledge. In other words, the mode of accessing the brain does not influence the object under scrutiny. These imaging devices have been heralded as revolutionary because they seemingly allow scientists to directly observe the biological basis of mental behavior, serving as the "missing link" that brings mind and brain together (Cappa, 2001, p. 10). This leads to conclusions like that of Posner and Raichle, who declare that "the images of mind . . . have rendered the mind-brain separation obsolete" (1994, p. 241).

This statement is characteristic of the revolutionary discourse that permeates contemporary neuroscience. However, theories of biological materialism and its attempts to fuse the gap between mind and brain have been around for centuries, and science has produced various images of the brain for at least decades. Is cognitive neuroscience with its functional imaging technologies really all that new or revolutionary? In this chapter, I want to query the singularity, or the specificity, of contemporary brain imaging. Part of this project involves situating the arrangements of mind and matter produced by contemporary brain imaging discourses as contingent and particular historical formations. This emphasis on the *arrangement* of mind and matter, or nature and culture, suggests that they are articulated, or the contingent productions of discourse, rather than a priori and universal states of being (see Stormer, 2004). Discourse, in this sense, does not refer exclusively to language but includes both linguistic and nonlinguistic entities (DeLuca, 1999a, p. 342; Laclau and Mouffe, 1985, p. 107-112).

Articulation is the term used to describe the way in which meaning emerges through processes of thematizing and combining elements (Angus, 1992). Thematization is a prior activity that results in distinct elements: in other words, thematization is consistent with the sense of articulation as speaking forth, or giving voice. To articulate in this sense means to differentiate an element from an anonymous backdrop, to foreground something as distinct and capable of entering into a relationship. Scientific discourses about the brain, for instance, articulate the brain when they constitute it as a distinct object capable of scrutiny and manipulation. The brain is articulated differently when it is a congealed, tangible organ residing in the head that can only be visualized through surgical interventions, and when it is a digitally-constructed display of electric and chemical activities. The second aspect of articulation, combination, is the forging of a linkage, the bringing together of two (or more) thematized elements into contingent interaction.

The critical recognition is that elements are not “natural” or “cultural” in any essential sense, rather they are produced as such through procedures of interaction. The articulation perspective is not simply a theory of “linguistic construction” or social constructivism that presumes that a natural world pre-exists cultural activity but is only given meaning through that social activity. Instead, this perspective takes “one more turn after the social turn,” in Latour’s phraseology, arguing that both nature *and* society emerge as the productions of a prior activity that cannot be characterized as natural or cultural (1998). The consequence for historicity, Latour writes, is that “we do not have, one the one hand, a history of contingent human events and, on the other, a science of necessary laws, but a common history of societies and things” (p. 284). He gives the example of Pasteur’s microbes: they are neither timeless entities discovered by Pasteur, nor the products of political domination, nor even a mixture of the two. They are “a new social link that redefines at once what nature is made of and what society is made of” (p. 284).

Just like Pasteur’s microbes, the brain is neither a timeless biological organ nor the linguistic construction of powerful scientists and/or politicians. The brain is a social link that exhibits substantial historical variability, and the varying discursive emergences of this brain simultaneously transform the meanings of nature and society. The aim of this chapter, then, is to attempt to lay the foundation for conceiving of the singularity of contemporary brain science: in other words, what is different about contemporary neuroscience, and in what ways can it be traced back to historical antecedents and traditions? This is in part a historical treatment of neuroscience and in part a rhetorical examination of the production, function and circulation of brain images. There are several excellent histories of neuroscience (Brazier, 1984; Changeux, 1985; Clarke and Jacyna, 1987; Finger, 1994; Gross, 1998; McHenry, 1969; Star, 1989; Young, 1990; Zimmer, 2004), ranging in scope and complexity. McHenry's classic revision of *Garrison's History of Neurology* is an excellent reference, and Stanley Finger's more recent *Origins of Neuroscience* is an essential historical treatment. A comprehensive review of the history of neuroscience is beyond the scope of this project. Instead, I have chosen to examine the particular characteristics that define contemporary brain mapping by way of historical contrast.

As Restak describes, one important difference between the Old Brain and the New Brain is that the New Brain is normal. Scientists can access the brain noninvasively, it is claimed, and they can thus view the neural substrates of typical, everyday behaviors and do not have to rely on pathological cases. Additionally, because imaging technologies allow scientists to view the brain in time, the New Brain is dynamic, a field of "subtle operational details" rather than a collection of discrete yet static regions. The New Brain is, in many respects, a thoroughly postmodern brain, constructed by neuroscience's "fragmenting and distancing deconstructions of the body carried out with the aid of visualization apparatus" that reveals the brain to be "a constantly changing mass of cell connections" (Stafford, 1996, p. 131-132). The first section of this chapter briefly traces the history of contemporary neuroscience. The second section examines the singularity of contemporary brain science, developing the discontinuities between the Old Brain and the New Brain.

The Brain is the Center: The Roots of Cephalocentrism

Stanley Finger (1994) describes the history of neuroscience as the history of the development and acceptance of the "localization of function" hypothesis, or the idea that different parts of the brain carry out different operations. Localization has been the reigning assumption in neuroscience since the 19^{th} century. The problem of the relation between mind and brain “finds its most precise scientific expression in the related problems of classifying and localizing the functions of the brain” (Young, 1990, p. xxii). This history follows a specific pattern: since the 19^{th} century, the dawn of the “era of cortical localization,” the dominant trend has been to “divide all major brain parts into progressively smaller functional units” (Finger, 1994, p. 3). The goal of this movement is a precise map of the brain that exactly correlates each function with a specific location. Today, there are few challenges to the underlying premise that the brain is composed of discrete units that interact to produce specific functions (Star, 1989; Uttal, 2001). The few remaining challenges from “Gestalt” psychologists or “holists,” who believe that the brain functions as a single unit that cannot be broken down into modules, or discrete units, are rarely taken seriously in mainstream contemporary brain science.

The localization hypothesis is part and parcel of a materialist perspective that views the biological brain as the source of all mental functions. This cephalocentric orientation can be traced back to Galen (130-200), who used animal experiments to help establish brain physiology as a definitive science. Galen recognized that brain injuries had significant consequences for mental function and behavior, solidifying his belief that the brain is the highest seat of the soul and intellect, in contradistinction to the ancient and Aristotelian view that the heart was “the acropolis of the body” (Finger, 1994, p. 14). Galen’s brain localization differed from the unabashed materialism of contemporary brain science: he focused not on the gray matter of the brain, but the ventricles, or empty cavities. These ventricles would remain the focus of brain theories for centuries.

By locating mental functions in the hollow cavities of the brain, scientists were able to retain a certain ambiguity regarding the relationship between brain and mind, or soul. Because the ventricles were not actually flesh, it was possible to maintain a belief in an immaterial soul or spiritual agency that remained uncorrupted by human flesh at the same time it resided in, or worked through, this flesh. Galen's views were taken up by the Church Fathers in the fourth and fifth centuries, and they located different cognitive faculties in different ventricles (Changeux, 1985; Zimmer, 2004). Zimmer explains, "The brain itself was merely a pump, squeezing the spirits out of the ventricles and into the nerves" (2004, p. 16). The views of Galen would come to dominate throughout most of the Middle Ages, with increasing attempts to designate mental faculties and locate them in the ventricles. These are often viewed as the first models of cerebral localization, crude attempts at locating specific functions in specific areas of the brain (Changeux, 1985, p. 8; McHenry, 1969, p. 26)

The ventricular theory was definitely overthrown in the Renaissance, when "the anatomy of the brain became modern with one bound" through the works of Vesalius (1514-1564), who reworked much of Galen using human dissection instead of relying on animal models (McHenry, 1969, p. 40). Vesalius was committed to the belief that cerebral flesh, rather than the empty ventricles, were responsible for the faculties attributed to the brain. The views tentatively introduced by Vesalius, fearful of challenging the reigning theological paradigm, would be definitely launched by Thomas Willis (1621-1675), the "most outstanding neuroanatomist" of the 17th century and the contributor of the word "neurology" to the modern lexicon (McHenry, 1969, p. 55). Willis ushered in the "Neurocentric Age" with his view that the brain is not only the chief organ of the body but the source of human subjectivity, or simply another way for conceiving of the human soul. Willis "reconceived thoughts and passions as a chemical storm of atoms" instead of the fluctuations of spirits in empty ventricles (Zimmer, 2004, p. 6). Willis completed what Vesalius had started, moving the focus of the brain from the ventricles to the flesh. He not only assigned cognitive faculties to the substance of the brain, he also attempted to localize specific functions in specific areas. Finger writes, "Willis, more than any other person in the post-Renaissance period, provided a sound basis and powerful stimulus for looking at the functional contributions of individual brain parts" (1994, p. 24).

By the 17th century, the idea that the brain was not only the central organ of the body, but also an organ responsible for the functions of the soul, or mind, had a significant presence in scientific and philosophical consideration. Scientific thought had moved from the cardiocentric theories of the ancients to a recognition of the brain's centrality in sensory and motor behaviors, and from there to an understanding of the brain's role in all cognition and behavior. Cursory attempts to localize specific functions in specific regions of the brain paved the way for the localizationism that would help to solidify the materialist backbone of contemporary neuroscience in the next two centuries. Although major steps toward cementing this orientation had occurred by the 17th century, the influence of Descartes and the continued importance of religious beliefs in an immortal soul and spiritual agency continued to challenge the materialist perspective. With this summary, I do not want to suggest that the history of neuroscience is a story of continuous progress, a linear narrative of scientific knowledge overcoming obstacles in its inexorable advance toward the modern perspective. My goal is to provide some basic background regarding the historical precedents of contemporary beliefs to better situate both the continuities and discontinuities of contemporary neuroscience. I do not ascribe to a teleological or “Whig” version of history or scientific progress, as later chapters will hopefully confirm. If I engage in language that suggests otherwise, it is because I see it as the most efficient way to provide minimal background for conceptualizing the context of contemporary neuroscience discourses.

Mapping the Brain: The Era of Cortical Localization

One of the most infamous attempts to use localization as a way of bringing together mind and brain is the science, or pseudo-science, of phrenology. The contemporary brain mapping project is often referred to as the “new phrenology,” in both derisive and affectionate tones, because it ostensibly undertakes a similar task in its attempt to tie mental function to specific parts of the brain.[7] The phrenological doctrines of Franz Joseph Gall (1758-1828) and Johann Spurzheim (1776-1832) are the most notorious, if not the earliest, attempts to localize cognitive functions in specific areas of the brain. Gall called his science “organology,” and he posited that the brain was a bundle of some 27, later at least 37, different organs. The size of these organs was proportional to the preponderance of traits, and they manifested themselves at the surface of the skull. Thus, a phrenologist or organologist could determine the characteristics of an individual by examining the protuberances of his or her skull. Among Gall’s original 27 faculties were reproductive instinct, aggressiveness, and verbal memory, as well as pride, glory and devotion. Although many of Gall’s categories appear suspect today, his secularization of the brain and his rejection of Cartesian dualism make him an important figure in the history of neuroscience. Although many neuroscientists are uneasy about embracing the traditions of phrenology, many recognize Gall as the "eccentric grandfather" of modern brain science.

It is possible that Gall would be in greater favor today if his science of organology had not been appropriated as a social reform movement (Leahey and Leahey, 1983). Madeleine Stern (1971) traces the story of the Fowlers, an American family who kept phrenology alive long after it fell into scientific disrepute. The Fowlers traveled about holding carnivalesque spectacles, propagating phrenology as part of an evangelistic practice of identifying sinners and determining appropriate reform measures. This juxtaposition of phrenology and religion was ironic, because one of the most damning criticisms of Gall was his avowed materialism and apparent determinism. In any event, phrenology quickly fell out of scientific favor and the view that the visible attributes of the skull represented character traits was widely ridiculed in the scientific and popular community by the early to mid-19th century.

Despite the failures of phrenology, the localizationist movement would emerge stronger than ever a few decades later. Localization efforts would no longer focus on the external characteristics of the skull: instead, "experiments made by nature" would provide powerful support for the brain mapping endeavor. One of the most famous of these "experiments made by nature" is a classic in introductory psychology textbooks. The tale of Phineas Gage is conventionally told as a "riches to rags" story where in 1861, Gage, a responsible citizen and dedicated worker, is seriously injured when he accidentally shoots a metal rod through his skull while working on a railroad. Gage survives, but, as the legend is told, his personality is so drastically altered his physician famously comments, "Gage was no longer Gage." The tale of Phineas Gage often emerges in brain science discourses as an early indication that the brain functions as a set of coordinated parts, and not as an undifferentiated unit. Additionally, Gage's dramatic transformation from responsible citizen to raging circus freak is viewed as evidence that seemingly ephemeral personality traits are just as biological as sensorimotor tasks (see, for instance, Damasio, 1994).

Regardless of the accuracy of this conventional narrative, the story of Gage describes a method of scientific study that is still used today, often referred to as the "lesion method." The lesion method simply involves observing the effects that brain injury has on its subjects. The underlying logic is what Star describes as a logic of deletion: When an area of the brain is damaged, or absent, and behavioral abnormalities result, the part of the brain that is lesioned is determined to be responsible for carrying out the expected, normal behaviors. Thus, Hannah Damasio's recent work to reconstruct Gage's brain using computer models in order to pinpoint which areas were damaged utilizes this lesion method and its logic of deletion—the parts destroyed by the tamping iron are determined to be critical areas for the regulation of emotion and rational decision-making (H. Damasio and Frank, 1992).

Paul Broca's 1861 paper, described as "the most important clinical paper in the history of cortical localization," utilizes the lesion method to support the localization hypothesis (Finger, 1994, p. 38). Unlike Gall, Broca is widely embraced by contemporary neuroscientists—if Gall is the eccentric grandfather, Broca, whose ideas "became a mandate and program for subsequent researchers," is the revered father (Star, 1989, p. 5). Broca had a patient who was unable to speak except for the word "tan." After Tan, as he came to be known, died, Broca performed an autopsy and found extensive damage to the left frontal lobe. Broca presented his findings as definitive proof of the localization hypothesis, locating fluent, articulate speech in the frontal cortex. Broca concluded, "There are in the human mind a group of faculties and in the brain groups of convolutions, and the facts assembled by science so far allow me to state, as I said before, that the great regions of the mind correspond to the great regions of the brain" (Broca, 1861, in Star, 1989, p. 1). The area that Broca isolated as responsible for articulate speech is known today as Broca's area, and damage to this area results in Broca's aphasia. Broca's conclusions were augmented by Fritsch and Hitzig's famous laboratory experiments on dogs. In 1870, Fritsch and Hitzig found that stimulating the exposed cortices of dogs with electrical currents produced different types of motor activity depending on the area of application. The data they collected suggested that distinct areas of the cortex were responsible for different types of functions, such as motor activity, sensation, and cognition. They wrote, "Certainly some psychological functions, and perhaps all of them, in order to enter matter or originate from it, need circumscribed centers of the cortex" (1870, in Finger, 1994, p. 40). In 1874, these experiments were replicated on a human subject when Roberts Bartholow, an American professor, carried out controversial experiments on a dying girl whose brain was partially exposed by illness. He found that the girl moved her limbs and felt tingling sensations when he electrically stimulated certain areas of her cortex. The evidence for localization continued to mount during the late-19th century. Changeux writes, "This 'new phrenology,' in which precise functional localization replaced the naïve naming of faculties, was based not on an approximate cranioscopy but on an undeniable anatomical and functional criteria" (1985, p. 21).

As the evidence for brain localization continued to build throughout the 19th century, a major controversy was brewing between the advocates of the “neuron doctrine,” the belief that brain cells were independent, discrete entities, and advocates of reticular theory, the view that the brain cells formed a seamless net and only functioned as a whole. McHenry describes this dispute as “the storm center of histologic controversy,” (1969, p. 164), and this conflict set the parameters for later debates between reductionists, or those who believed the brain’s functions could be broken down into smaller units for analysis, and holists, those who believed the brain must be approached as a single, homogenous unit. During this time, Golgi developed the technique of staining cell tissue with silver to better observe it under a microscope. Ironically, Golgi subscribed to the reticular net theory, but Ramon y Cajal is credited with definitively disproving this theory using Golgi’s own techniques. The two were jointly awarded the Nobel Prize in medicine and physiology in 1906, the same year that Sir Charles Sherrington published the landmark *The Integrative Action of the Nervous System*. Sherrington introduced the term “synapse” to describe the space between individual neurons. The proof that the brain was composed of a number of individual neurons was a major boon for localizationists because it provided evidence that brain functions could be broken into small, interactive spatial units. A contemporary cognitive neuroscience textbook expresses the implications: “The nervous system is not a big blob; it is built from discrete units. If we can figure out how these units work, and describe the laws and principles of their interaction, then the problem of how the brain enables mind can be addressed, and eventually solved” (Gazzaniga, Ivry, and Mangun, 1998, p. 11).

Localization theories reached their apex in the 1940s and 1950s with the rise of psychosurgery and, in particular, the contributions of Wilder Penfield and Lamar Roberts. Penfield was a student of Sherrington, and he and Roberts published the highly influential *Speech and Brain Mechanisms* in 1959. Penfield and Roberts mapped the limits of the cortical speech areas, the "eloquent brain," using electrical interference. They were trying to remove certain parts of the brain to alleviate seizures and other symptoms of patients suffering from epilepsy. To safely do this, they needed to know which areas of the brain were vital to rational speech so they could avoid removing these parts. Their patients were given local anesthesia but remained conscious during the procedures. Penfield and Roberts electrically stimulated areas of the exposed cortex. They found that when certain areas were stimulated, the patients would be unable to find the correct words to express themselves. This procedure allowed them to devise a detailed map of the areas of the brain responsible for different language and speech functions. Their images of exposed cortices covered in scraps of numbered paper have become classic images in the history of brain science.

Modern brain imaging technologies were mostly developed in the latter half of the 20^{th} century. These imaging technologies, however, did not signal a sea change in scientific sentiment. The commitment to brain mapping projects and their reductionist premises were solidified in the 19^{th} and 20^{th} centuries, and its has its roots in ideas that can be traced back for centuries. It is worth noting that the reductionist or localizationist perspective has always developed as part of a materialist or naturalist explanation of human behavior and cognition. Star writes, "Wherever possible, localizationists opted for explanatory primacy for the physical realm. The brain caused the mind, and not the other way around. If only they could understand the brain, the mind would follow" (1989, p. 159). Alternatives to localization, for instance the Gestalt or holist view, were much more likely to advocate some type of mind/body parallelism or some theory that maintains a separation between mind and brain. Star writes that theories of representation emerge from this latter orientation, as they posit "a kind of Cartesian sign language, where body and mind mutely gesture across the epistemological gap of parallelism" (1989, p. 173).

Accessing the Mind: Cognitive Psychology

Biological materialism might be the reigning assumption in the sciences of the mind, but scientific study of mind-brain interaction has faced a significant stumbling block: is it possible to scientifically access subjective mental states? Even if these states are caused by, or correlated to, biological events, the question remains: Is their some qualitative difference between subjective experience and objective material processes that makes the former "off-limits" to science? In his famous essay, "What is It Like to Be a Bat?," Thomas Nagel frames this question as a conceptual, rather than an epistemological, question (1974). Nagel concludes that while we might have evidence for the truth of "physicalism," we cannot have a conception of how physicalism could be possible because it is impossible to formulate objective concepts that correspond to subjective experiences. Until the late 1950s, most of psychology, dominated by behaviorist perspectives, shared this conclusion. Behaviorism, whose most prominent advocate was B.F. Skinner, argues that mental states are inaccessible to scientific psychology. The psychologist is limited to the study of observable behaviors, because there is no way to operationalize subjective mental events.

In the late 1950s, psychology changed almost overnight from thinking about behavior to thinking about cognition (Gazzaniga, Ivry, and Mangun, 1998, p. 19). A major influence in shift was the work of linguist Noam Chomsky, who argued that there are innate structures in the human brain that govern language behaviors. In this period, cognitive psychology began to emerge as an alternative to the behaviorist schools of thought and it "fostered the notion that processing stages and cognitive activity could be analyzed with respect to their interlinked components" (Gazzaniga, Ivry and Mangun, 1998, p. 20). The term "cognitive psychology" emerged in the 1970s to describe what was becoming a growing field dedicated to scientific study of human thought (Gardner, 1985/1987). Cognitive psychology assumes that mental tasks can be accessed scientifically because they can be broken into component parts and then analyzed. These parts were often operationalized by conceiving of the mind as an information-processing system and constructing computer models that purportedly represented, or mirrored, cognitive processes. Much of cognitive science is indebted to computer models and metaphors, and cognitive science is closely allied with artificial intelligence research, or attempts to study non-human entities that mimic human cognition and behavior (see Gardner, 1985/1987; Searle, 1984; Turing, 1950).

According to Marcus Raichle (1998), cognitive neuroscience emerged as an important growth area within neuroscience in the mid-1980s. Cognitive neuroscience believes that mental operations can be accessed and defined objectively through the empirical methodologies of science. Because the mind is not tangible, this assumption has been difficult to realize in practice. Neuroscience, especially the development of powerful imaging technologies, helps cognitive psychology's project in two important ways. First, by equating mind with brain, the object of study is no longer an abstract philosophical concept but a concrete biological entity. Second, brain imaging technologies are perceived as enabling noninvasive but direct access to the brain. In a nutshell, then, cognitive neuroscience merges cognitive psychology's interest in defining cognitive processes by breaking them into discrete, analyzable units and neuroscience's ability to access the brain noninvasively.

Cognitive neuroscience represents an amalgam of disciplines and intellectual traditions that can be traced back for years, decades and even centuries. Conversations about the relationship between the mind and the brain are seemingly eternal preoccupations in the history of thought, and despite the attention to the current "frenzy of biological materialism," this, too, is in many respects old news. In this perspective, it might be easy to pass off the proclamations of a neuroscience "revolution" as scientific propaganda. However, this would be to miss the discontinuities introduced by contemporary neuroscience and functional brain imaging technologies. In the next section, I turn to this singularity of contemporary brain science.

So Is There Anything Revolutionary About Brain Imaging?

Functional brain imaging is the linchpin of the revolutionary discourse sweeping cognitive neuroscience. Functional brain imaging, the "holy grail" of neuroscience, includes several different technologies that allow scientists to image active brains at various degrees of spatial and temporal resolution. Although these technologies have been developing for decades, recent technological developments are often described as a "breakthrough" in the scientific study of the brain (Uttal, 2001, p. 2; see also Raichle, 1998). The key word is *functional*: these technologies do not simply reveal the structure of brains with static images, they also allow scientists to track the function of brains across time. Uttal explains, “We can now determine the location and even the time course of processes that occur during brain activity” (2001, p. 36).

Functional brain imaging technologies include functional magnetic resonance imaging (fMRI), positron emission tomography (PET), and event-related encephalography (EEG) and magnetoencephalography (MEG). These technologies are based on the understanding that changes in cellular brain activity are accompanied by changes in brain metabolism and hence local blood flow.[8] PET works by measuring these changes in blood flow. Changes in brain blood flow are accompanied by changes in oxygen consumption, and it is this change that fMRI detects because it is sensitive to the amount of oxygen carried by hemoglobin. EEG and MEG technologies measure the electrical signals and magnetic fields that accompany neuronal activity. These technologies operate at different levels of spatial and temporal resolution. PET, for instance, has an excellent spatial resolution (in the order of millimeters) but does not have the precise temporal resolution of EEG and MEG (the temporal resolution of PET is typically tens of second or even minutes, but EEG and MEG resolution can reach the order of milliseconds). EEG, however, does not have the same spatial resolution as PET, because the electrical currents are measured after they are conducted by the skull, which is not a homogeneous conductor (EEG measurements might be between 6 to 11 millimeters, depending on equipment and recording conditions). A current trend in research is to combine several different technologies to maximize the benefits each has to offer.

These technologies have important attributes that shape the revolutionary discourse of cognitive neuroscience and constitute the historical specificity of contemporary brain science. Specifically, functional brain imaging is heralded as revolutionary because it is *noninvasive* and because it can measure *function*, or cognitive processes as they occur in time. Because these technologies are noninvasive, they need not rely on the "lesion method." Instead of limiting the study of the biological substrates of behavior to pathological cases, these technologies allow scientists to explore the biology of "everyday" experiences and behaviors, articulating neuroscience as helpful knowledge for everyday living instead of a field limited to the study of illness and abnormality. The fact that these technologies are able to access not only the structure but also the function of the brain results in descriptions of the brain as a dynamic network, a collection of interactive processes, rather than the assembly of discrete, static organs. Modern neuroscience is not just about curing the sick. Steven Johnson writes that this science is "as relevant to the healthy as it is to the ill, as relevant to those of us wrestling with the small triumphs and tragedies of everyday life as it is to those battling more forbidding demons" (2004, p. 16). In the later case studies, one of my main arguments is that neuroscience comes to regulate everyday practices of living, obscuring the distinction between the normal and the pathological. Functional brain imaging enables this discourse of "everydayness" that permeates popular accounts of neuroscience. Functional brain imaging frees neuroscience from relying on the lesion method, enabling access to the "living, normal" brain instead of isolated scientific study to the aberrant and pathological. Nancy Andreasen explains, "These newer imaging techniques permit us to directly visualize which parts of the healthy, intact brain are used to perform specific mental activities," techniques that are "more powerful and accurate than the lesion method" (2001, p. 57).

It is possible to produce brain images that correspond to virtually any subjective mood, experience or behavior. Brain images purporting to depict the neural correlates of such diverse events as orgasm, drinking Coke versus drinking Pepsi, and cognitive and emotional processing of all sorts have been produced. Scientists do not have to wait for "experiments made by nature" and then use the subtraction method: they simply determine what parts of the brain are active for a particular activity or experience by directly imaging the brain processes that correlate with that activity or experience. Eric Kandel describes the revolutionary power of these technologies in *Newsweek*: "The power of the new imaging technologies is that they peer inside the minds of the healthy. They allow us to study how the living brain performs sophisticated mental functions. With them, we can address the most complicated questions in all science" (quoted in Begley, 1992, p. 66). Scientists are no longer limited by the happenstance occurrence of injury or accident: instead, they can correlate any person, and any mood, thought or behavior, with a biological state by producing corresponding brain images.

Not only can brain imaging technologies access the *normal* brain, they also access the *living* brain. Donna Haraway argues that the sciences, including mathematics, linguistics, psychology, anthropology and biology, have undergone a Kuhnian paradigm shift in the past few decades: "The primary element of the revolution seems to be an effort to deal with systems and their transformations in time" (1976/2004, p. 17). The ability to view the human brain in time is a critical definer of contemporary brain discourse and imaging technologies. This ability to access the living, dynamic brain visually is part of a discursive shift from viewing the brain as a collection of discrete, relatively independent organs to viewing the brain as a complex conglomeration of systems, networks, and circuits. Seeing in time, as Keller describes, is key to the illusion of veridicality that infuses the computer-generated images of the body's interior (2002). This discursive shift, which Keller describes as crossing the vital barrier, not only lends the images an ethos of truthfulness or realness, it also changes the way in which the body is understood. There is a simultaneous emphasis on smallness of seeing, or an increasing focus on molecular and cellular individuality, a focus that borders on molecular vitalism (Keller, 2002, p. 230). When the focus shifts from the organism to the dynamic elements of its composition, the vocabularies that result speak of networks, distributions and circuitry rather than static locations and centralized organizations.

Broca, for instance, had to rely on a combination of the lesion method and autopsy. He observed the behaviors resulting from an unknown brain pathology, and he was only able to determine the part of the brain affected after Tan's death allowed him to open the skull and examine the brain. He could clearly view the parts of the brain that were damaged, and he concluded that the damaged areas were responsible for Tan's loss of function. Broca's mapping was purely structural: he identified the structure of the brain responsible for a certain ability or pattern of behavior. Functional brain imaging allows access to the brain while the subject is alive, but it also allows access to the *living*, or dynamic, brain. Because these technologies have relatively high degrees of temporal resolution, they are able to map function as well as structure. This has led to what Quartz and Sejnowski (2002) call the "post-modular" era in brain research. The critical premise of neuroscience, developed from the tradition of cognitive psychology, is that the brain is composed of smaller units that carry out specific functions. This modular theory can also be traced back to Gall’s organology: the brain is not a homogeneous organ, but a collection of smaller organs. The emphasis with functional brain imaging, however, is a shift from *place* to *process*. Neural functions are not firmly located in specific structures, rather, they emerge from processes that occur through the interaction of different chemical pathways and electrical circuits. The brain is a network, and functions are distributed throughout that network. These networks can only be discerned with technologies that enable scientists to access the dynamic brain, as it functions in time.

The ability to view the brain “in real time” leads to descriptions like the following, from Oliver Sacks:

> The process of re-entrant signaling, with its thousands or hundreds of thousands of reciprocal connections within and between maps, may be likened to a sort of neural United Nations, in which dozens of voices are talking together, while including in their conversation a variety of constantly inflowing reports from the outside world, and giving them coherence, bringing them together into a larger picture as new information is correlated and new insights emerge. There is, to continue the metaphor, no secretary-general in the brain (1995, p. 108).

The brain is not a hierarchically organized set of modules, but a swarm of electrical and chemical elements that forge contingent connections and course dynamic circuits. The brain is, in Daniel Dennett’s words, a “Pandemonium of Homunculi,” with no central arbiter to authoritatively keep the order. Consciousness, or the sense of self or “I,” is an emergent property, an evanescent illusion that is generated by the underlying neural processes. A frequent metaphor is the symphony, or the orchestra, but one without an identifiable maestro: each element carries out its function, and somehow the result is relative harmony. Problems, for instance headaches, are not disorders that can be attributed to a personality or even an identifiable lesion, but “the result of wayward circuits and molecules” (Gorman and Park, 2002, p. 78).

Metaphors of communication are ubiquitous in descriptions of this New Brain. In the Sacks excerpt above, the brain consists of “dozens of voices,” in conversation with each other and engaged in acquiring information with the outside world. There is no dictator—it is a conversation in the strictest sense of the word, a collaborative and emergent, organic process that has not been scripted out in advance. Andreasen uses similar language, describing what images show us about the brain: “The daily conversation between neurons, which makes possible complex functions as language or memory, is conducted via messages sent through chemical couriers: the neurotransmitter systems of the brain” (2001, p. 75). The brain is “composed of multiple distributed circuits,” systems that are interwoven and interdependent with no one system having the role of command (p. 85). She describes the brain imaging revolution, “The goal is no longer to light up a specific region activated by the task, but rather to map the complex distributed functional circuits that the intact brain uses when it thinks and feels” (p. 150).

When the brain is understood as a distributed “society of specialists” in continuous conversation, it is far more dynamic entity than Gall’s phrenological brain or the modular brain of early cognitive psychology. Gall linked personality traits to the static structural formation of the skull; in contemporary neuroscience, these traits emerge from the interactions of scattered circuits. This results in an emphasis on the brain as “plastic,” a continuously changing collective. Not only did Gall solder personality traits to static physical structures, these structures—the protuberances of the skull—were solely determined by the internal structure of the brain. In cognitive neuroscience, the brain is "plastic" because it is a conversation informed by internal and external feedback, such that clear individuations between interior and exterior are difficult to sustain. Schwartz and Begley define neuroplasticity as "the ability of neurons to forge new connections, to blaze new paths through the cortex, even to assume new roles. In shorthand, neuroplasticity means rewiring of the brain" (2002, p. 15). They describe a number of different "forces" that can shape the brain and influence these wiring processes, including "mental force," or will—an internal influence that is intangible, as well as external influences including material environmental factors. Hooper quotes Hyman of the National Institute of Mental Health: "What we know now is that anything—whether a drug, a war experience or a talking therapy—changes the way the nerve cells talk to each other" (1996, p. 49-50).

Functional brain imaging, because of the way it produces visualizations of an active brain in time, and because it accesses the chemical and molecular movements of neural processes, depicts a "plastic brain" that is opened to the outside, its conversations influenced by a seemingly infinite array of stimuli. This emphasis on function, rather than structure, not only opens the brain to the outside, leading to a shift from the closed collection of modules to an open collective conversation. It results in new ways of conceptualizing difference and identity. When Gall linked personality to the externally visible characteristics of the skull, his methodology was more categorical than interpretive. In other words, Gall's method was not designed to "reveal" a deeper or hidden truth about individuals; instead, he simply classified displayed behavioral characteristics with visible physical characteristics.

Cognitive neuroscience, however, claims to go beyond the association of external characterological traits and similarly external physical traits and reveal deeper truths through functional brain imaging. Begley (1995) explains, for instance, that the high temporal resolution of new technologies is critical to visualizing function, and this access reveals things that would otherwise be hidden. In the case of gender differences, studies have been inconclusive on whether anatomical differences between men and women correlate with distinctive patterns of thinking. Now, however, “thanks to an array of new imaging machines that are revolutionizing neuroscience, researchers are beginning to glimpse differences in how men’s and women’s brains actually function” (Begley, 1995, p. 48). Because researchers can “catch brains in the very act of cogitating, feeling or remembering,” they can diagnose differences in function that might not be manifest in clearly anatomical or structural differences. She writes, “Already this year researchers have reported that men and women use different clumps of neurons when they take a first step toward reading and when their brains are ‘idling’” (1995, p. 48). The difference between neuroscience and phrenology is substantial: by imaging the internal processes of brain activity, neuroscience can uncover differences that might not be manifest at the physical (structural) level *or* in terms of displayed behaviors. In the above case, men and women exhibit the same behaviors, but the means used to produce these behaviors are different. Thus, not only does functional brain imaging produce a plastic brain that varies continuously from one moment to the next, it also reveals differences at the “deeper” level of function, visualizing differences even in instances of apparent surface identity.

Later case studies will take up the implications of the plastic brain in greater detail, documenting the explosion of specifications and interventions enabled by the visual access to function.

Donna Haraway describes a trend in the life science in which "the body ceases to be a stable spatial map of normalized functions and instead emerges as a highly mobile field of strategic differences" (1991, p. 211). As the ubiquity of communication metaphors in the biological sciences (see Niehoff, 2005) suggests, the body becomes a semiotic system and disease "a subspecies of information malfunction or communications pathology" (Haraway, 1991, p. 212). Thought of as a communication system, biology becomes plastic and dynamic, and individuation is no longer a clear demarcation: "Any objects or persons can be reasonably thought of in terms of disassembly and reassembly; no 'natural' architectures constrain system design" (p. 212). Human beings are probabilistic systems that can be interfaced with other systems, and the clear grounds for ontological distinctions between the organic, textual and technical vanish.

The fact that functional brain imaging is part of a discourse that obliterates the clear-cut distinctions between human and non-human, word and thing, has led some to argue that contemporary neuroscience does not embody materialism in the way it claims. Elizabeth Wilson, for instance, suggests that many manifestations of neuroscience result in a "decapitated Cartesianism," in which the mind, although it is defined as "biological," is still privileged over the passive body (1998). Stafford similarly points to a distinction between the isolated brain and the disposable body that makes neuroscience, despite its postmodern infusions, an heir to Cartesian dualism (1996). Slavoj Zizek takes this thread further, arguing that contemporary materialism is better thought as "spectral materialism," or a "post-metaphysical idealism" (2004, p. 24-5). The reduction of the mind to neural processes that occurs in neuroscience is, for Zizek, the same type of reduction that occurs when matter is defined as information, or code. These are simply "two sides of the same coin, as two reductions to the same third level" (p. 25). However, instead of concluding, like Wilson, Stafford, or Hayles (1999), that the materialist gesture is incomplete and reifies the idealism it seeks to avoid, Zizek views these dual reductions as a double movement that demands a new theorization of causality as immanent, a version of causality that does not depend on a clear ontological chasm between matter and communication: something very much like articulation.

Conclusion

This chapter began as history and ends as theory, pointing the way to the three case studies. Generally, this chapter traces important moments in the conventional history of neuroscience to better contextualize contemporary neuroimaging. As Lisa Cartwright (1995) illustrates in her studies of the "coproduction" of medicine, technology and culture, the history of science and the history of culture are not separate currents, but interanimating and intertwined, distinguished by blurry and inexact boundaries, if at all. It is tempting to read a history of human subjectivity, or human nature, onto the history of neuroscience. After all, human nature is often defined by the relation between mind and body, and neuroscience takes up this relation directly. Certainly Stafford (1996) makes this point when she notes that the contemporary brain images correlate with a postmodern subjectivity: they are digital, dynamic distributions of elements with no determinate command center. With this suggestion, I will proceed to the next chapter where I examine the circulation of brain images in a brain-based self-help book to determine what practices of self-constitution are produced in contemporary brain science discourses.

CHAPTER THREE

"HOW DO YOU *KNOW* UNLESS YOU *LOOK*?": SCIENTIFIC BRAIN IMAGING AND CONTEMPORARY TECHNOLOGIES OF THE SELF

The biosocial movement confuses many of the oppositions, including nature vs. culture, that have traditionally grounded our episteme, or our widely held understanding of reality. This confusion results in some seemingly odd and paradoxical rhetorical productions including what I will call "brain-based self-help books." Self-help books are recognized as a distinct (albeit contested) genre identified by several common features. In the *Authoritative Guide to Self-Help Books*, the authors offer the following definition: "Self-help books are books that are written for the lay public to help individuals cope with problems and live more effective lives" (Santrock, Minnett, and Campbell, 1994, p. 4). Self-help books have been linked to the American ideals of self-invention and self-mastery (Anker, 1999; Dolby, 2005; McGee, 2005), and they typically aim to inspire and instruct their readers by providing wisdom and encouragement for tasks ranging from the specific and concrete (finding a spouse, managing money responsibly) to the general and abstract (having a "peaceful soul," finding one's "inner self"). One defining feature of self-help books is that their readers must be active agents capable of empowering themselves and undertaking self-improvement measures. Many self-help books are written by self-proclaimed "experts," and most incorporate dome scientific knowledge into their recommendations. The "brain-based" self-help books are unique, however, in that they conform to the generic qualities of self-help books, including the first and foremost characteristic of positing or constituting an active reader-audience, yet they are also consistent with the materialist monism of neuroscience that posits an extreme version of biological causation. Thus, this discourse encompasses both an extreme ideology of individual agency and the premises of biological materialism.

There are a growing number of publications that qualify as part of the "brain-based self-help" category. I identify this subgenre by four characteristics. First, the books must conform to the generic constraints of self-help literature. Specifically, they must be books authored for a public audience with the express purpose of providing practical resources (including wisdom, inspiration and instruction) for self-improvement. This means that the books are predominantly written in the first and second person forms of address ("I" and "you"). Second, these books must be written by neuroscientists or neuropsychiatrists. Third, the biology of the brain must be a central theme of the books (in other words, they must be generally consistent with the discourse of biological neuroscience). The final characteristics is not so much a selection criterion as a feature that is shared by all of the books that meet the first three criteria: The brain-based self-help books all rely on brain imaging research as a powerful persuasive resource. The ability to visualize the brain with technologies such as PET, MRI, and SPECT is a central means by which neuroscience is articulated as relevant to the construction and maintenance of desirable selves. I will focus the following analysis on a recent brain-based self-help book, Daniel Amen's 2005 publication, *Making a Good Brain Great: The Amen Clinic Program for Achieving and Sustaining Optimal Mental Performance*. I engage this text in order to isolate the rhetorical dimensions of the move to biosociality, the mutual articulation of science and society on a common plane, that are associated with the transformation of science into a discourse of everyday living. After describing the characteristics of the brain-based self-help genre, I describe Amen's *Making a Good Brain Great* as an exemplar. I use Foucault's discussion of "technologies of the self" to describe the ways in which brain-based self-help literature enables self-constitution in a biosocial age. Brain images are a critical component of this rhetorical formation, as they discursively constitute the brain as a "space" of attention and intervention. In addition, the images produced by functional technologies allow individuals to construct their identities outside of oppositional frameworks such as "normal and pathological."

The Amen Clinic and the Brain-Based Self-Help Movement

The market for self-help books has exploded in the past decade, with the constant demand leading *Publishers Weekly* to dub the genre a "Teflon category" (quoted in Salerno, 2005, p. 9). The market for self-improvement literature grew 50% between 2000 and 2004, and is currently an $8.56 billion a year business, with projections for 2008 at $12 billion (Salerno, 2005, p. 9). One-third to one-half of all Americans have purchased a self-help book at some point in their lives, making the genre a powerful economic and cultural force (McGee, 2005, p. 11). Between 1972 and 2000, the number of self-help books more than doubled, from 1.1% to 2.4% of the total number of books in print (McGee, 2005, p. 12). Micki McGee reports that one New York City bookstore devotes a quarter of a mile of shelf space to various categories of self-improvement literature (2005, p. 12).

Aside from statistical data, another indicator of the genre's influence is the growing number of books and articles published about the self-help phenomenon. In 2005 alone, three books about self-help books were published, joining a growing conversation about the causes and consequences of America's preoccupation with self-improvement literature (Anker, 1999; Dolby, 2005; McGee, 2005; Salerno; 2005; Tiede, 2001). These responses range from the overtly critical (Salerno, 2005; Tiede, 2001) to the more moderated academic (Dolby, 2005; McGee, 2005), and they indicate that the self-help movement is a contested arena. Within communication scholarship, there has been considerable attention to the consumption of self-help books and the interactions between readers and the texts (Coyle and Grodin, 1993; Grodin, 1991; 1995; Lichterman, 1992), ranging from the critical to the celebratory. Discursive analyses of the texts and the therapeutic rhetoric they exemplify tend to be negative (Cloud, 1998; Ebben, 1995), mostly because therapeutic responses are thought to individualize social problems and disempower vulnerable groups, particularly women, through the encroachment of expert authorities.

The self-help tradition has always intersected with discourses of scientific authority (Woodstock, 2005), however, brain-based self-help books constitute a specific subgenre, or a unique rhetorical formation. Dolby (2005) identifies four characteristics that define the self-help genre in terms of both content and function. First, the content of the books must be nonfiction and aimed toward self-improvement. Second, the books must be written in an informal style, with the author ("I") directly addressing the readers ("you"). In other words, the books must be widely accessible, directed toward a public audience with no particular expertise. Third, self-help books participate in a problem-solution discourse: more specifically, Dolby writes, the books aim to enlighten readers about the negative effects of our culture and worldview (problem), and suggest new attitudes and practices that might lead to more satisfying and effective lives (solution) (2005, p. 38).

Finally, the books have an educational function that goes beyond remediation. Even if the books are intended to have a curative effect, it is their purely educational dimension that ultimately sets them apart as a distinct genre. This defines the self-help philosophy: individuals cannot simply take the advice of experts to achieve transformation, rather, the cure depends on their own acquisition of knowledge.

In the past decade, the general proliferation of self-help books includes the growth of a particular category: brain-based self-help books. These include Jeffrey Schwarz's *Brain Lock: A Four-Step Method to Change Your Brain Chemistry* (1996), Richard Restak's *Mozart's Brain and the Fighter Pilot: Unleashing Your Brain's Potential* (2001), Ryuta Kawashima's *Train Your Brain: 60 Days to a Better Brain* (2005), and Daniel Amen's multiple books, including *Change Your Brain, Change Your Life: The Breakthrough Program for Conquering Anxiety, Depression, Obsessiveness, Anger and Impulsiveness* (1998) and *Making a Good Brain Great: The Amen Clinic Program For Achieving and Sustaining Optimal Mental Performance* (2005). These books share the four characteristics Dolby outlines as constitutive of the self-help genre, and they also have in common three additional features. First, these books are all authored by neuroscientists or neuropsychiatrists. Additionally, the biology of the brain is central to their content. All of these books claim to bring the wisdom of neuroscience into the everyday lives of the general public. Thus, these discourses participate in *both* the self-help tradition of individualist self-mastery *and* the scientific discourse of biological determinism. Finally, all of these books incorporate brain imaging as a central persuasive resource. Not all of these books generously feature myriad visual representations as Amen's books do, but even in the absence of images they all call upon brain imaging research to ground their claims.

In this essay, I focus on Daniel Amen's recent publication, *Making a Good Brain Great* (2005). Amen, a clinical neuroscientist, psychiatrist and brain-imaging expert, is in many ways a central node in his own rhetorical formation. Amen is the head of the four Amen Clinics, all of which specialize in the clinical use of SPECT brain imaging. He has a significant presence in the public sphere as the author of nineteen books (translated into thirteen languages), a number of audience and video programs, a regular column in *Men's Health*, and numerous articles and interviews in popular sources such as *Newsweek*. Amen regularly appears on popular television shows, including the *Today* show, *Ricki Lake*, *The View* and CNN, as well as radio shows and speaking engagements. He has won awards for his role in authoring anti-drug campaigns, as well as other areas of his research and writing. His book *Change Your Brain, Change Your Life* (1998) was a *New York Times* bestseller, unexpectedly selling tens of thousands of copies in its first year, in part because it "struck a nerve with readers who love a 'scientific' hook" (Quinn, 1999).

If Amen's authority in the public sphere is assured, his scientific credentials are less certain. Although Amen is a professor at the prestigious University of California at Irvine's School of Medicine and a Distinguished Fellow of the American Psychiatric Association, he is not unconditionally accepted as a legitimate expert. Experts who turn to the self-help genre are often disparaged by their own disciplines because popularization work is not seen as respectable academic scholarship, in part because it is associated with a profit motive. For Amen, the skepticism is also directed toward the content of his work. Amen's broad clinical applications of SPECT brain scans are not widely accepted by the neuroscientific community. The scientific consensus is that brain images have great potential as a research tool, but limited practical applications in clinical settings. Amen acknowledges these doubts throughout his work, often describing himself as a scientific martyr who suffers injustice because of his forward thinking. Amen skirts these criticisms in another way that is more relevant to this project: he acknowledges the limitations of brain imaging in clinical setting as far as *diagnosis* is concerned, but he maintains that the images have an important *persuasive* function that is independent of their strictly medical utility. In this chapter, I examine how Amen uses brain images as inventional resources in a brain-based self-help discourse that articulates neuroscience as a practical knowledge for everyday living.

Fifteen Days to a Better Brain!

Amen's *Making a Good Brain Great* is constructed as an educational "how-to" manual, promising readers that they can improve their brains in as little as fifteen days. The book is divided into two sections: The first details nine "brain-centered principles to change your life," each chapter devoted to a specific principle. The primary purpose of these chapters is educational. The main theme is that the brain is a major actor in virtually all areas of life. The first principle encapsulates this theme: "Your brain is involved in everything you do." Throughout the first half of the book, Amen instructs his readers on the biology of the brain, the benefits of imaging technologies, and the different categories of living that are determined by brain biology. In the second half, Amen presents "The Amen Clinic Program For Making a Good Brain Great." This is the "how-to" portion of the book. Each chapter is dedicated to a different set of tasks: maintaining a healthy diet, exercising on a regular basis, listening to soothing music, managing stress, and having positive social interactions, including regular sexual relations are themes of different chapters. In the concluding chapter, Amen combines these tasks into a fifteen-day program, with each day devoted to improvement in a specific area.

In terms of the content of his suggestions, Amen hardly breaks new ground. In many respects, the second half of the book reads like an annotated amalgam of existing self-help books, each devoted to a specific topic such as diet, exercise, social interaction or stress management. For instance, in the diet chapter Amen condemns those foods that are “laden with calories, refined carbohydrates, and damaged fats,” indicting the fast-food culture that thrives on “super-sizing” unhealthy products (2005, p. 89-90). His proffered alternative is to increase water intake while decreasing consumption of the bad foods and focusing on a diet of protein, good fats, and carbohydrates. The chapter even includes a collection of healthy recipes, ranging from a low-fat chicken omelet to blueberry ice cream. There is nothing novel about these recommendations, and they are so commonplace they verge on the clichéd. The difference is that these are described as recommendations that are designed not for the health of the person, but the health of the brain. Food is a “powerful brain medicine” (p. 89), and the suggestions are “brain-promoting nutritional tips” (p. 91). Calorie restriction is “helpful for the brain” (p. 91), and the recipes are “brain-healthy recipes” (p. 104). Amen describes his company’s board meeting dinner, which featured a menu specifically designed to “honor healthy brains,” consisting of a spinach salad, steamed broccoli, and grilled salmon (p. 112).

The rest of the chapters follow this pattern. Commonplace recommendations for self-improvement are reiterated, this time in terms of their effects on the brain. Physical exercise is important because it allows the brain to generate new neurons, and coordination activities are lauded for their brain-enhancement potentials. Regular sexual relations are vital to a healthy brain, because it is “the largest sex organ in the body,” involved in everything one does, “including everything sexual” (p. 134). Amen writes, “sex is key to keeping the brain healthy,” however, he adds with emphasis, “*The sex described in this chapter is sexual activity with a committed, loving partner*” (p. 135).[9] Men’s and women’s different attitudes toward sex and intimacy are the product of brain differences. “Weird” sexual fetishes are “brain symptoms” (p. 143). The how-to recommendations are all consistent with this formula: take existing, commonsensical knowledge (including social mores) and re-articulate it in terms of how it relates to the brain as both cause and consequence of behavior.

Given the routine nature of Amen’s content, there are two things that make this self-help book unique. The first is the sheer scope of the project: While most self-help books that take the form of a how-to manual isolate a specific theme (diet OR career advancement OR sex), Amen takes on all of them, providing extremely specific advice for the most mundane aspects of daily living (for instance, individuals are advised to use real, rather than artificially flavored, vanilla extract in the milk they are to consume before bedtime to ensure proper rest). Amen brings together an enormous variety of social and individual practices, articulating their commonality by way of the brain. Second, Amen’s book is differentiated by the ubiquitous images that populate its pages. Diverse individual and social technologies are linked by way of the brain, and this linkage is grounded in the authority of visual evidence—functional images of the brain. Brain images are both an essential part of the verbal narrative and an important material feature of the text. Amen frequently references brain images by calling upon descriptions of the imaging process and the images themselves to support his claims, and, in addition, he includes multiple representations of brain images for the readers' own consumption.

Neuroscience and Technologies of the Self

As medical advice, Amen's address is distinguished by its insistence that the patient *understand* his or her own problems. More importantly, individuals must understand their problems through the biological vocabulary of neuroscience. It is not enough for individuals to accept Amen's prescriptions on the grounds of his expertise and authority; each person must come to a scientific understanding of his or her life experiences. This self-knowledge is inextricably connected with specific ways of acting. Amen's inducement to a neuroscientific vocabulary and the corollary program for living is akin to what Foucault describes as "technologies of the self," which permit individuals to effect "a certain number of operations on their own bodies and souls, thoughts, conduct, and way of being, so as to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, or immortality" (1997, p. 225). Foucault emphasizes that the technologies of the self entail not only certain modes of training and self-correction, but also certain attitudes (see also Foucault, 1988).

Foucault's discussion of these technologies foregrounds three important considerations that will emerge as themes throughout this analysis. First, knowledge of the self is intimately linked to practices, or modes of behavior. Although at times Foucault draws a distinction between knowledge of the self and "care of the self," the distinction is not between knowledge and practice but between two different technologies that involve their own forms of knowledge *and* practice. Second, technologies of the self involve both the relation one has with oneself and the relations one has with others. Finally, these technologies entail a particular type of power. Technologies of the self cannot simply be dictated by an authority, rather, they must be actively taken up by each individual in daily practice. Thus, power is understood as a productive and self-constituting force and not a repressive exercise limited to scientific authorities or the state. When this power functions at the level of life itself, it is biopower (see also Foucault, 1977, 1978).

Knowledge and Practice: Self-Help as a Program for Daily Living

In the brain-based self-help books, attitudes, or ways of understanding the self, are inseparable from actions upon the self. Amen's fifth principle, for instance, is "Know and Heal the Brain Systems That Run Your Life." This chapter is intended to educate readers about the different functions of six brain systems. This understanding is not merely educational, however, it is vital to correction. Amen begins the chapter, "To make a good brain great, it is important to have a basic understanding of how the brain works, including its strengths and weaknesses" (p. 32). Amen presents a "hands-on guide" to understanding the brain, emphasizing that it is essential to know "that certain parts of the brain tend to do certain things, and that problems in specific areas tend to cause identifiable troubles" (p. 32). When one understands the way the brain functions, it is then possible to identify the precise location of problems and then begin "targeted treatment."

This "hands-on guide" differs from impersonal pedagogical instruction and it is highly participatory. Readers are invited to learn not about "the" brain, but about *their* brain. The chapter leads with a self-report quiz, asking readers to rate themselves on 60 different symptoms from 0 (never) to 4 (very frequently). The quiz includes items such as "difficulty expressing empathy for others," "upset when things do not go your way," and "fingernail biting." The answer key matches the items with each of the six brain systems: items 1 to 10, for example, correlate with the prefrontal cortex, or "PFC." After the readers have completed this quiz, they are instructed on the precise functioning of each system. This instruction takes the form of conditioning readers to understand their experiences and behaviors in a biological vocabulary that specifies their neural origins. For instance, Amen states that an inappropriate reaction to hearing about a death should be understood as an overactive amygdala. Worrying excessively should be understood as "high activity in the ACG," or the anterior cingulate gyrus. Each brain system description is accompanied by a full-page table that lists the types of problems associated with underactivity and overactivity of that region.

These vocabularies are taken up as ways of understanding not only the self, but also the behaviors of others. In *Change Your Brain, Change Your Life*, for instance, Amen writes that children with OCD (obsessive compulsive disorder) often have "cingulate parents" (1998, p. 165). Readers are advised that if they are engaging in an argument with someone who clearly has a "cingulate" problem, or makes one think, "She's so cingulate!", the best thing to do is avoid the conflict by retreating to the bathroom with a large book (1998, p. 177). The terminologies of biological neuroscience become a colloquial language to understand behaviors. Here, cingulate becomes an adjective that describes not biology but behavior. It is also an interpretation with specific consequences. If a person's argumentative behavior is understood as rudeness, one will react differently than if their behavior is understood as a biological “misfire,” or an illness.

The biological vocabulary is not simply one among many: it is a way of understanding experience that one *should* adopt to the exclusion of alternatives. The normative dimensions of this terminology are highlighted in several different ways. Initially, a biological understanding is necessary to healing and improvement, as “having a sense of the systems that run your life will help you know your strengths and the areas that need more attention” (2005, p. 49). Further, understanding is itself a type of healing because it eliminates destructive attitudes such as guilt and self-blame. Amen writes that a biological understanding results in “reduced shame, guilt, stigma and self-loathing. This understanding can promote self-forgiveness, often the first step in healing” (2005, p. 252). The negative thoughts that are produced by self-blaming are themselves causes of pathological brain patterns. Accepting that one’s behavior is caused by biological factors outside of their control is both a type of self-knowledge and a material action that changes the self.

Neuroscience and Human Nature: Defining the “Good” Human

Technologies of the self can be read as a particular era’s mode of articulating “human nature.” For Foucault, human nature is “the aggregate of the forms we have chosen to provide public definitions of who we are” (Hutton, 1988, p. 125). Human nature is not “natural,” but consists of “the linguistic and institutional artifacts left behind by successive generations as each took up anew the task of creating categories to explain its perception of the human conditions” (Hutton, 1988, p. 125). Underlying Amen’s program of technologies of the self is an ideology of human nature, exemplified in his distinction between "will-driven" and "brain-driven" behavior. He explains, "Will-driven behavior comes from a healthy brain. It allows you to exert conscious choice over a situation to work in your own best interest" (2005, p. 8). Healthy, will-driven behavior is goal directed and productive and includes social relationships as well as individual behaviors and attitudes. People with healthy brains "tend to make the best employees, the best husbands and wives, the best parents, friends, employees, and citizens" (p. 11-2). Brain-driven behavior occurs when the brain does not function in a healthy manner and literally "hijacks" the will. Brain malfunctions deprive individuals of their free will and deny them "access to their true selves" (p. 12). Amen frequently uses the term "hijack" to describe the brain's action on the self. Amen describes his conclusions of clinical practice, "The brain function of my patients who did bad things was much worse than that of people who were living productive, healthy lives" (p. 15). He summarizes this in the form of a principle, "When your brain works right, you work right, and when the brain is troubled, it is very hard to be your best self!" (p. 16).

Amen's distinction between will-driven and brain-driven behavior is indicative of a philosophy of human nature that undergirds much of the neuroscience discourse. Nancy Andreasen, for instance, summarizes this philosophy the opening of *Brave New Brain*, "Human beings are wondrous, goodly, and beautiful creatures" (2001, p. 3). This philosophy of human nature defines human "goodness" in terms of social behaviors. Good humans are good citizens. Humans are fundamentally good creatures who, in their natural state, form positive relationships, excel in the workplace, exhibit attitudes of kindness and compassion, and refrain from criminal or other socially devalued behavior.[10] Any deviation from this "ideal citizen" is evidence of a brain pathology that is outside of the individual's direct control. Thus, the adoption of a neuroscientific vocabulary is more than a particular way of describing behaviors: It involves philosophical presuppositions about human nature, and individual acceptance of this philosophy is vital to the healing process. Throughout his books, Amen includes countless examples of patients who beat themselves up for their failings. Only when they recognize its biological origins are they freed from this self-abuse and capable of transforming their lives.

This vocabulary of motive is not exclusively for the interpretation of the self, but also for the interpretation of the behaviors of others. Amen engages in another discourse that is ubiquitous in the rhetoric of neuroscience: the discourse of "stigma." Amen tells the story of Jill, a woman who was nearly fired from her job for chronic lateness. She claimed that she tried to get to work on time, but she was late seven out of ten days. Once her employers understood that she had a brain problem, however, they were able to understand that she did not have an attitude problem, but a problem with brain function, and she was able to keep her job. The biological vocabulary necessitates an interpretation of the negative behavior of others as an illness, not a moral failing or weakness of character. To blame others for their undesirable behaviors, which are actually "symptoms" of brain-driven behavior, is to "stigmatize" them, or to engage in prejudice and discrimination. The language of stigma highlights the normative dimensions of the neuroscientific vocabulary for understanding experiences and behaviors, both of oneself and others.

This neuroscientific reservoir of technologies of the self illustrates the rhetorical dimensions of biosociality in at least two ways. If biosociality is characterized by a “blending” of the natural or scientific and the social, then the neuroscientific philosophy of human nature presents just such an admixture. Human “nature” is a biological state of health, but health is defined only by its social expression. Illness is marked not by biological pathology, but by social “pathologies,” including problems in relationships, crime, and other types of deviance. Social events become the primary signs of biological illness. The neuroscientific vocabulary mingles the social and the biological in a second manner. The scientific terminology becomes the moral and socially sanctioned mode of accounting for the behaviors of oneself and others. The failure to adopt this discourse and its concomitant ideology of human nature is to engage in stigmatizing and discriminatory behaviors. The move to understand deviance as a biological problem has been described as a civil rights movement, akin to the black struggle for freedom or gay struggle for equality. The biological vocabularies are socially correct discourses. The authority of neuroscience, then, issues not solely from its grounding in the natural order, but from its ethical quality as a mode of social interpretation.[11]

Technologies of the self have been described as rhetorical procedures that involve self-knowledge in accordance with shared or communal norms (Foss, Foss & Trapp, 2002, p. 357). In general these technologies concern both who human beings are said to be, and the various means through which the notion of being is created. If Hutton is correct, and human nature is not an a priori given but something that is discursively constructed, then the properly rhetorical task is to trace the patterns of discourse, attentive to the technologies that constitute knowledges and practices of the self. In the brain-based self-help literature, visual images of the brain are important rhetorical elements that shape the discursive construction of human nature and its attendant practices. In the next section, I examine the circulation of brain images in Amen's book to elucidate the role of the visual in this rhetorical formation.

"*How Do You* Know *Unless You* Look*?*"

This is the title of Amen's seventh chapter (emphasis mine), and it indicates that knowledge is intimately connected to, and in fact dependent on, looking. Brain images are central to Amen's project and they are the evidence that grounds both the nine brain-centered principles and the detailed recommendations for brain improvement. Amen is recognized for using SPECT (single photon emission computed tomography) imaging in clinical settings. His clinics have performed more than 30,000 of these scans, comprising the largest database of SPECT images. SPECT imaging is a nuclear medicine procedure that measures brain blood flow. The assumption is that brain blood flow is correlated with brain activity. The data is constructed into 3D images that model these patterns of brain activity. Amen's books are replete with black-and-white representations of these images, and his website and educational pamphlets include colored representations of SPECT images.

The SPECT images are presented as visual evidence that is highly legible to even an untrained audience. Amen explains, "SPECT scans look at function or how the brain works. SPECT results are actually very easy to read and understand. We look at areas of the brain that work well, areas that work too hard, and areas that do not work hard enough" (2005, p. 8). Later he writes, "Scans must be clear, understandable, easily illustrative of brain function, and available to the patient on a timely basis. We believe our 3D rendering software makes the scans easy for professionals, parents, and families to understand" (2005, p. 255). Throughout *Making a Good Brain Great*, SPECT scans are presented as legible through Amen's description of their usage in clinical settings, and in the way the actual images are framed and presented. In this section, I will look first at the images themselves, and then discuss the ways that these images are framed in the text by way of image vernaculars.

The Images

There are two types of SPECT images: 3D surface images and 3D active images. The surface images depict blood flow at the brain's cortical surface, and are set to display the top 45% of brain activity. These images display brain function or activity, but they look like "objects," or representative models of brain structure. They have an apparent density and solidity that foster the impression that if the referent were present, one could pick it up and hold it for visual and tactile inspection. The 3D surface image corresponding to a healthy brain shows "full, symmetrical activity," and looks like a clay model of an actual brain. It appears to be smooth, and there are no holes or gaps in the surface. The images of unhealthy brains appear to be moth-eaten. They show dramatic holes and gaps rather than a smooth structure, and they suggest that the brain physically decays when it is correlated with the unhealthy state (for instance, negative thinking or drug use). In the book, all of the images are in black-white and grayscale. The colored images are even more dramatic. The brains are depicted in varying shades of yellow, orange, purple and blue. The top-down view of the healthy brain is an organized blend of yellows and reds, each shade subtly blending into the next. The unhealthy brains, covered in holes and structural defects, display sharply contrasting shades to illustrate the "underactivity" or "overactivity" associated with a particular area.

The other images are 3D active images, which compare average brain activity to the "hottest" 15 percent of activity. These images look much different than the surface images. They look like graphs: the whole brain is modeled as a three-dimensional grid displaying fine lines interconnected in web-like fashion. Specific parts of this 3D diagram are filled in with shading to suggest overactivity. Although these images appear more like graphs than the surface images, which look like actual representations, they suggest a simple relationship between brain activity and the image. The complex averaging procedures and statistical work that goes into producing these images are lost in the neat, simple-looking images that are presented for the readers' consumption and interpretation. Although I am not primarily concerned with the "truth value" of these images, it is worth pointing out that, like all functional brain imaging, they have no diagnostic utility. In other words, it is not possible to image an individual brain and determine from the image whether that person is healthy or whether they have a particular disorder. This is in part because brain activity varies substantially from individual to individual, and most research studies average data from many individuals to produce results about specific populations. This leads to a circularity in Amen's presentation of the images. In his discussion of imaging, he defines a healthy brain by way of external behavior: a healthy brain is identified, in other words, if the individual is a good citizen (see Amen, 2005, p.11-2). This circularity highlights the fact that the images are not primarily diagnostic tools, but persuasive tools that have functions independent of their medical utility.

One way Amen meets the challenge this lack of diagnostic utility poses is through comparison. Brain images almost never appear alone: they are always accompanied by at least one other image, and their framing invites comparison. This comparison can take several forms. In some instances, a healthy brain is juxtaposed to an unhealthy brain. These are typically 3D surface images, and the healthy brain is smooth, while the unhealthy brain is riddled with holes and exhibits signs of decay and deterioration. In other cases, the comparison takes the form of a before and after staging. Often, the before picture depicts the disordered brain prior to treatment, and the after picture shows the success of the treatment. Many of these are 3D active images, and they visually depict a "cooling" effect as "hot" areas are deactivated through normalizing treatments.

The comparative display of the images resonates with the discussions of "underactivity," "overactivity," and the definition of a healthy brain as "balanced" and "symmetrical." As mentioned previously, the healthy brain is defined in terms of the healthy citizen, or a display of "healthy" social behaviors. Because health is defined through its social manifestation, and because the brain is imaged as a dynamic entity, there are serious obstacles to a biological definition of a "normal brain." In other words, there is no visual standard that dictates what a healthy brain looks like. By using comparisons that show dramatic differences, the problem of a standard brain image no longer intrudes. In addition, the comparative displays highlight the dynamism of the brain and the significant effects of changes in stimuli. The difference between a smooth, apparently whole, healthy brain and the brain riddled with gaping cavities creates a strong visual impact.

The SPECT surface images are dramatic, in part because they appear to be representative of the structure of the brain. Amen designed a drug education poster that depicts eight SPECT surface images, in full color, labeled to show a normal brain and the brains of cocaine users, alcohol users, inhalant users, meth users, marijuana users, and smokers. The healthy brains are smooth, while the other brains exhibit varying degrees of empty space, holes and deterioration. The large letters above the images query, "Which Brain Do You Want?" The poster, developed in 1997, was widely circulated. It hang in over 100 prisons, hundreds of schools across the country, drug treatment centers, and hospitals. In Cleveland, the criminal court system gives the posters to people who pass through the system. Amen describes the success of this poster, "The damage caused by substance abuse is immediately apparent" (1998, p. 243). He describes asking his patients the question of the poster (Which brain do you want?): "They want the use of their whole brain. 'Not one with holes in it,' as a nineteen-year-old stated" (p. 243). Another responded, "I don't want any holes in my brain. I'm stating away from drugs" (p. 243). This example indicates the power of these surface images and their ability to suggest that certain behaviors, in this case drug abuse, creates real, physical "holes" in the structure of the brain. Although the images are in fact graphic representations of data that assess the comparative levels of activity of the brain (and only the 45% most active parts), the images themselves appear to represent their referent in a very different manner.

The 3D active images are different, in that they appear more grid-like and less like representations of dense objects than the surface images. These images compare brain activity to the "hottest" 15 percent of activity. They are usually described as depicting "under" or "over" activity, an imbalance or an asymmetry in brain activity, descriptions that accord with the graph-like character of the images. The display of "hot" and "cool" areas, defined by colors and shading, on a brain-shaped grid, suggests the brain as a mathematical space of activity. The brain loses the density and inertness of the "wet brain," and instead appears as a something with the qualities of the digital technologies that are used to produce the image. When these images are compared, the dramatic differences in color and shading on the brain-grid suggest that the brain is also capable of being manipulated by the same or similar logics that manipulate digital technologies. With careful and precise adjustments, the activity levels can be "balanced," and the graph will depict symmetrical shadings and an appropriate coordination of hues. This image is far more consistent with the contemporary understanding of the brain as a functional space of distributed activity than actual photographs of the "wet brain." In the next section, I continue to explore the rhetorical function of these brain images by looking more closely at the ways in which they are talked about.

Image Vernaculars

The primary function of the SPECT images is rhetorical rather than medical (or persuasive rather than diagnostic). This is clear in the way that Amen talks about the images and their function in clinical settings. The images are used for three different, albeit overlapping, persuasive purposes. First, the images are used to educate readers about the "true nature" of their experiences, encouraging the adoption of a neuroscientific discourse for interpreting one's experience (knowledge function). Second, the images are used to increase compliance with certain treatment procedures (practice function). Finally, the images are used to promote specific modes of interpreting and responding to the behavior of others (social regulation function).

Educational Function

Images are essential means of persuading patients that their negative experiences are physical problems and not defects of character. Amen tells the story of Ian, a patient who was having family problems and taking too long to get through college. Ian was discouraged and hopeless, and this anxiety fueled his problems. After a brain scan, Ian was given a diagnosis of ADD (attention deficit disorder). The scan did not produce the diagnosis, rather, it functioned to convince Ian that his problems resulted from a biological illness. Amen explains, "When he listened and understood what his scan really showed, he was more relaxed and had hope that things could be better" (2005, p. 149). Ian had a "new attitude" toward himself after viewing the scan. In *Change Your Brain, Change Your Life*, Amen shares a personal narrative that similarly attests to the force of brain images in altering self-understanding. While waiting in line at a restaurant, he observed a woman fall to the ground. He stood frozen, unable to assist her. He writes, "I used to feel guilty about not moving quickly in those situations, but it has helped to learn that my brain just doesn't permit me to do so" (1998, p. 84). The scan showed activity in the basal ganglia that Amen correlates with an inability to move quickly in anxiety-provoking situations.

Stories of the epiphanic function of viewing brain images are frequent in the brain-based self-help literature. Jeffrey Schwartz describes:

> I began showing patients in the treatment group their PET scans, to drive home the point that an imbalance in the brain was causing their obsessive thoughts and compulsive behaviors. Initially, some were dismayed that their brain was abnormal. But generally it dawned on them, especially with therapy, that they are more than their gray matter. When one patient, Dottie, exclaimed, 'It's not me; it's my OCD!' a light went off in my head: what if I could convince patients that the way they responded to the thoughts of OCD could actually change their brains? (Schwartz and Begley, 2002, p. 79).

The act of looking at images of one's brain is in itself therapeutic because it brings about a moment of enlightenment, when the patient is faced with evidence that their negative experiences are "not me." Images of biological interiors exteriorize undesirable experiences by severing them from the "true self." As Schwartz describes, with the viewing of scans, "the patient then attributes [their negative experiences] to aberrant messages generated by the brain and thus fortifies the awareness that it is not his true 'self'" (2002, p. 81).

Viewing brain images brings one into direct visual contact with their "illness" or abnormality. The relationship between the viewer and the scan is one of identification: although it is unsettling to learn that one is ill, it is actually "good news" (Amen, 2005, p. 149) to learn that the source of problems is "not me." In his work on visual representations of madness and mental illness, Sander Gilman (1988) documents how individuals project their own fears of illness and disintegration onto images that serve to localize and domesticate this fear. Illness is seen as an undesirable loss of control, and creating images of this illness seemingly demarcates this loss of control, making it constantly external to one's sense of self. Anxieties about mental illness are replaced by control over images, and viewers become distanced observers as sight constructs an abyss between the healthy and the ill. Through images, a sense of control, or delimitation, is achieved as the viewing self is cut off from the viewed other (Gilman, 1995).

The brain scan images, in contrast, invite individuals to actively identify themselves as ill. In the neuroscience discourses, illness is not a state clearly demarcated from health, but a mode of attribution available to all individuals. The loss of control associated with mental illness is a productive mode of self-constitution. Viewing the brain images is a way of dividing the subject up in itself, a way for individuals to differentiate certain aspects of their experience as “not me.” Viewing the neural correlates is taken up as a way of distancing one’s “true self” from actions, thoughts and moods that are undesirable, introducing a gap or cleavage into the very heart of subjectivity. This is an example of what Foucault terms “dividing practices,” in which the subject is objectivized by being either divided inside himself or herself, or divided from others (1983, p. 208). Gilman’s work examines the latter category of dividing practices, or how visual representations demarcate the healthy and the ill, the sane and the insane. Brain images are representative of the former: they are a mode of self-constitution that divides the subject up from the inside. The opposition between health and illness is no longer between the “normal self” and the “insane other,” rather, the opposition between forces that are external to each other is transposed into an internal struggle. This interiorization has important consequences for the ways in which subjects “care for,” or act upon, themselves.

Practical Function

Amen recognizes the persuasive force of the brain scan images when he writes, “A SPECT scan allows patients to see a physical representation of their problems that is accurate and reliable, and that helps to increase compliance—pictures are powerful. It can influence a patient’s willingness and ability to accept and adhere to the treatment program” (2005, p. 52). The “treatment program” might include medication, but is by no means limited to drug therapy. Amen tells the story of one woman who was “desperate to function as the good mother she wanted to be to her child” (1998, p. 49). Amen diagnosed her with depression and prescribed Prozac. The woman, however, “did not want to see herself in that light or be stigmatized” by the label of mental illness (p. 49). She stopped taking the medication, until Amen ordered a brain scan and “was able to point out to her the marked increase in activity in that area of her brain. It provided me with the evidence needed to convince her to go back on Prozac for a while longer” (p. 49). In this case, the scan images convinced the patient that the source of her poor mothering was biological and hence necessitated biologically-based treatments. More importantly, the scans convinced her of the “reality” of her illness, ameliorating the stigma associated with problems that are thought to stem from character or personality. The change in interpretation produced by the scan changed what consuming medications *meant* to this patient.

Medications are only one part of the “treatment programs.” Treatment is an ongoing process that includes a close attention to the moment-by-moment status of the brain. Images are used to evidence the biological effects of every activity and mood. Amen tells of one patient who was scanned twice: the first time, she was told to meditate on things that she was thankful for. In the second scan, she was told to think about all of the things she hated about her life. The comparison of the scans allowed her to “see the difference that an attitude of gratitude can make in the brain” (2005, p. 151). Amen warns, “Negative thought patterns change the brain in a negative way. Being grateful for the wonderful things in your life literally helps you have a brain to be grateful for” (p. 151). Individuals must constantly tend to their thoughts, because literally “every thought” has an immediate, physical effect on the brain (p. 152). This constant attention takes the form of consistent monitoring and reflection. Individuals must *think about* their thoughts, examining each one and assessing its positive or negative quality. This reflection should take the form of writing. Amen recommends, “Whenever you feel sad, mad, or nervous, write out what you are thinking. You will notice that many of those thoughts are irrational and hurtful” (p. 153). Amen includes a specific worksheet, the “One-Page Miracle,” in which readers are asked to write down their major goals using three headings (Relationships, Work/Finance and Self). The paper is to be placed in a conspicuous location and consciously reflected on at least once every day.

Amen’s book is rife with different practices that are part of the brain “treatment program,” ranging from listening to specific types of music, filling out various worksheets, watching the movie “Pollyanna” on a regular basis, and laughing regularly. These specifications of caring for the self are grounded in the visual authority of brain scans. The scans reveal the physical correlates of virtually all activities, and are deployed as evidence of the ways in which these activities affect the brain. As the comparative brain scans demonstrating the value of an “attitude of gratitude” show, the brain can change in an instant in response to a mood or behavior. The functional brain scans support a treatment program that is continuous and ongoing, a lifelong project that is never complete. This continuous management of life is what Foucault terms “bio-power.” He describes the emergence biopower as an historically specific mode of power, in which “biological existence was reflected in political existence” (1978, p. 142). Power does not simply deal with legal subjects, commanding their obedience through the threat of death, but invests living bodies. Biopower designates “what brought life and its mechanisms into the realm of explicit calculations and made knowledge-power an agent of transformation of human life” (p. 143). Biopower is both constitutive and continuous: in the brain-based self-help books, it is manifested as the mandate each individual has to constantly attend to and reflect upon their thoughts, emotions and behaviors, assessing their value for "life" through a biological discourse.

Social Regulation

Visual images of the brain constitute a specific type of relations with oneself, however, they are also have important rhetorical functions in the construction of social practice. Brain images are used to encourage interpretations of the behaviors of others that have significant social and political consequences. For instance, Amen writes of his reflections on the death penalty:

> Shortly after looking at the first brain scans I ordered, I started to get a very uncomfortable feeling. The brain function of my patients who did bad things was much worse that that of people who were living productive, healthy lives. If the brain is the organ of behavior and free will, and brain function was impaired, then obviously we all did not have the same level of free will (2005, p. 15).

These reflections led Amen to the recognition that "*killing people with bad brains is akin to killing sick people*," clearly a socially unacceptable practice (p. 15). He continues, "Subsequently I have scanned more than sixty murderers and more than two hundred other convicted felons. The brain dysfunction I saw was often dramatic" (p. 15).

Amen's thoughts on the death penalty are not merely personal philosophizing. Amen has appeared in court on a number of occasions as a witness who "explains bad behavior" by way of brain scans. He describes a particular instance, where a man, aggravated by his neighbors who were cutting down disputed tree branches, shot and killed two female neighbors in front of their two children. Amen was consulted to scan the man's brain. He writes, "The scans were used at his trial. The purpose was not to get him off . . . but to show the jury that Peter was not operating as a normal person with full access to his own faculties" (p. 17). The scans are visual evidence of motivation: images of the brain are equated with a lack of "free will" and prove a biological motivation outside of the individual's control. Not all of the examples are as dramatic as murder or a legal setting. Amen tells the story of a husband who was disturbed by his wife's unwillingness to engage in sexual relations. The wife was scanned, and showing the images to her husband "was a powerful tool in helping him to view the situation objectively: His wife was neglecting him not because she didn't like him but because something was off balance in the chemistry of her brain" (1998, p. 48). In another example, a man is distraught at a crowd's unwillingness to assist in a motorcycle accident. He "was relieved to learn a new interpretation of the situation" by way of brain scans: The intensity of the emotion from witnessing the accident "had overwhelmed the onlookers' basal ganglia and they had been unable to move, even though most of them probably wanted to help" (1998, p. 83).

Brain scans are a blueprint for social perception. The images become ways of shaping the answers to both the question of motive ("Why did that person behave in that manner?") and the question of response ("How should I respond to this behavior, as an individual and as part of a social collective?"). Behaviors that have a negative valuation are to be interpreted as biological illnesses rather than character defects or moral weaknesses (2005, p. 232). The interpretation directs the response: the man who killed the two women did not receive the death penalty after Amen showed the jury visual evidence of the defendant's brain activity patterns, and the husband did not divorce his sexually unresponsive wife. These biological attributions are what leads critics of the "rhetoric of therapy" to challenge these discourses on the grounds that they ameliorate collective action and social change by locating problems in individual "nature" (e.g. Cloud, 1998). Understood as a biosocial discourse, however, these discourses bring the social and the biological into direct contact, construing all levels of social practice as biological. The social is not so much displaced by biology as assimilated into the biological (see Rabinow, 1998). Through this "biologization," the social is reorganized in such a way that the types of political action Cloud and others are nostalgic for are no longer viable. I will return to this question of resistance in the conclusion of this project. In the remainder of this chapter, I describe Amen's address as a lateral scientific rhetoric specific to the biosocial context. I conclude by analyzing the discursive functions of health and illness in this context.

Scientific Discourse in the Biosocial Era

As a power that functions at the level of life, biopower becomes "an integral, vital function that every individual embraces and reactivates of his or her own accord" (Hardt and Negri, 2000, p. 23-4). In other words, regulatory tasks become freed from clearly demarcated institution sites and distributed throughout the social body for uptake by individuals. As Amen's book illustrates, the tasks of diagnosis, monitoring and intervention are no longer confined to medical institutions and administered by experts. Each individual is responsible for monitoring, diagnosing and intervening in both his or her own life and in the lives of others. The very existence of brain-based *self-help* books would be unthinkable in a disciplinary society: in a postdisciplinary, biosocial era, they make sense. Lester Friedman says of contemporary society, "Medicine, it seems, has replaced baseball as our national pastime" (2004, p. 2). Biological and medical vocabularies inform all types of social practice, and they are not the exclusive rhetorical domain of experts. The practices that accompany these vocabularies are similarly dispersed throughout society.

The brain-based self-help books are a rhetorical genre specific to the biosocial. Specifically, the self-help genre is one means by which the biosocial is brought about. Scientific knowledge reshapes society when it is “embedded throughout the social fabric at the micro-level by a variety of biopolitical practices and discourses” (Rabinow, 1998, p. 411). The brain-based self-help books embed neuroscience throughout the social field by dispersing diagnostic and therapeutic procedures for uptake by each individual. The characteristics of this form of address demand attention. Existing studies of the popular rhetoric of science for the most part limit their attention to forms of address that preserve scientific privilege through the process of translating science into an accessible form (studies of “priestly” voices). The mode of address at work in the brain-based self-help books is not priestly, but vernacular. The function is not to preserve scientific privilege but to “distribute” scientific knowledge as a part of everyday living for each individual.

Amen’s manner of addressing his readers suggests that the rhetorical consequences of a vertical relationship between science and society are different from the rhetorical productions of a biosocial arrangement where science and society are distributed on the same level. The scientific voice loses its exclusivity and becomes the privileged discourse of everyday living. Specific characteristics of this lateral form of address are illustrated in Amen’s book. Initially, Amen does not approach his readers as a guardian of specialized knowledge, making use of a scientific ethos, but rather as a fellow citizen. Amen shares personal narratives that put him in the position of his readers and foreground their commonality. For instance, he describes his own scanning experience:

> Even with all that I have accomplished in my life, I was still very anxious about going through the procedure. What if something was wrong with my brain? I never felt more naked than after my scan, when my own brain was projected onto a computer screen in front of my colleagues. At that moment, I would have rather been without clothes than without a covering of my skull (1998, p. 25).

The scan revealed that Amen has an overactive basal ganglia. He links this visual evidence to his experience: “My whole life I have struggled with minor issues of anxiety. I used to bite my nails and sometimes still do when I feel anxious” (p. 26). He includes a representation of his scan, labeled “Dr. A’s Anxiety-Affected Brain” (p. 26). Throughout his books, he includes anecdotes about his own experience, with themes ranging from the behavior of his cat to his experience at an N’ Sync concert with his daughter.

These personal touches and occasionally self-deprecating humor constitute a type of address between individuals with no substantial differences in power or status. Amen makes himself vulnerable before his readers, letting them know that he is just as human as they are. His experiences with brain imaging are unique, but they do not elevate him above the masses. He is not a gatekeeper, just someone who is passing on the benefit of his own life experience. He is, in fact, *abnormal*, or ill, just like his readers. As Dolby notes, an enduring feature of self-help books is that they provide their authors with an opportunity to “bear witness to their own transformation or conversion” (p. 48). The intimate, personal tone of address in self-help books conveys their authenticity and invites readers to identify with the authors as fellow sufferers. This is not to say that the books are not or instructive, and Dolby even describes their “proselytizing” function. A proselytizing address is different from a vertical or priestly (see Lessl, 1989) address, however, because the proselytizer, in this case, approaches from a common plane of understanding, and not as a gatekeeper who brings truths from a higher plane down to the commonfolk while preserving the boundaries that keep the planes intact.

Furthermore, the educational function of the self-help books is not simply didactic. Individuals cannot simply take experts at their word, they must come to their own understandings of their experiences. Each individual must master the appropriate scientific vocabulary for understanding and conveying his or her life. Thus, not only does Amen construct himself as a peer, he encourages his audience to see science as something simple and accessible. The scans are legible and relatively uncomplicated texts, and technical vocabularies are “colloquialized,” as in the description of behaviors as “cingulate.” Scientific terminologies are not special, but mundane. The have a different truth function because their authority is no longer grounded in the privileged sphere of Nature. Everything, the entire social plane, is a part of “nature,” so scientific vocabularies are simply an appropriate social discourse. This is the distinction Latour makes between “Science,” that stands in a vertical relationship to society, and “science” dispersed throughout the social “pluriverse” (2004, p. 38).

As scientific vocabularies are taken up as common, everyday modes of understanding oneself and constituting one’s identity, there is a shift of practices outside of the institutional domains marked by expert voices. Each individual is responsible for diagnosing and treating himself or herself: These responsibilities are not confined to medical institutions. A number of indicators, including but not limited to the popularity of brain-based self-help books, attest to this dispersion of institutional practices. The popularity of internet information allows individuals to both diagnose themselves and, in many cases, to access prescription medications with little or no mediation by a physician (Carnall, 1999). Consumer-patients are increasingly asking for specific medications from prescribing physicians, and in a vast majority of the cases, these requests are granted (Bell, et al., 1999; Kravitz, et al, 2002; Schwenck, 2005). Patients come to their physicians with a diagnosis in mind and a treatment already determined. Thus, even when patients are forced to enter institutional domains to pursue diagnostic and treatment options, the experts in these institutions are not the primary authorities: the patients are. It is important to contextualize these trends by examining the roles of health and illness in the biosocial context. As I have suggested previously, health and illness are best understood not as clearly demarcated biological states, but instead as rhetorical modes of attributing experiences and constructing identities that are universal in the sense that they are available to everyone. The merging of the natural and social blurs the boundaries between health and illness. Amen's title is instructive: *Making a Good Brain Great*. Self-improvement is not a cure for the sick, but the responsibility of everyone. Health is not a determinate state, or a possession that one either "has" or does not have, it is an elusive balance of qualities that remains forever outside of one's reach. One can always be *better*: if the brain is good, it must be worked upon so that it moves toward "greatness." The audience for the brain-based self-help books is universalized, as it is not only the sick and the struggling who are in need of a cure or fix. Everyone needs "a little help," and there is no stasis that one can reach that puts him or her outside of this therapeutic embrace.

Chapter 9 of Amen's book is titled, "The Myth of the Perfect Brain: We All Need a Little Help" (68). Amen cites statistics on the prevalence of mental illness, stating that mental illness is "normal" because close to half of the U.S. population will experience at least one illness during their lifetime. Amen relates how his clinic changed its name from the Amen Clinics Normal Study to the Amen Clinics Healthy Brain Study, change that some mistakenly think is "subtle" (p. 71). The change was the product of a strong belief that "normal is a myth and healthy brains are actually rare. There are very few healthy brains among us" (p. 71). Amen's admission of his own flirtation with mental illness illustrates the nonexistence of the normal—even the experts are actually just fellow sufferers. No one is exempt from illness. Amen encourages individuals to regularly screen themselves and be vigilant about early intervention in response to this knowledge that normal is a myth. Because health is not a determinate state but more of a vanishing horizon that is never achieved, these processes of self-screening, self-diagnosis and self-correction are never-ending tasks.

Conclusion

When brain images are unmoored from the scientific sphere and dispersed in popular discourses, they constitute powerful resources for the construction of individual identity. In self-help books, these images function as a crucial component of "technologies of the self," or ways of knowing, talking about, and acting upon the self for the purposes of producing a more perfect citizen. The citizen can always be *more* perfect: when health becomes operationalized as good citizenship, it is no longer conceived as a determinate biological state but a constant achievement that must be ever renewed in daily practice. Health, viewed in terms of citizenship and social behavior, does not lose its biological definition, rather, citizenship and social behavior are “biologized.” The very opposition between the social and biological is illegible in this biosocial context where each continually references the other.

The model of subjectivity that emerges is that described by Deleuze as “superfold,” a figure suggested by the double helix of DNA. The superfold frees “man” from a determinate identity and allows “him” to enter into complex relations with forces from the outside.[12] The very notion of interiority is replaced by a dynamic folding operation. The subject is produced, or rather articulated, by contingent combinations of forces. In the context of this chapter, the superfold is suggested by the ways in which brain images are used to encourage the subject to vigilantly attend to his or her every thought, mood and behavior as both a product and producer of biological states. Each thought, mood or behavior that emanates from the subject must be scrutinized as potential symptom (effect) and as potential cause of one’s biological state. The individual must constantly ask, “How are my current activities affecting the biological composition of my brain?” and “How is the biological composition of my brain contributing to my current behaviors?”

The superfold is characterized by a constant state of attention to the self, a continuous self-examination and a running commentary on one’s inner state of being, both physical and mental. Brain imaging technologies are part and parcel of this superfold: by thematizing the brain as both subject and object of this constant attention and bringing it into view, brain images promote a constant vigilance with regards to our interiors. The images offer us not only snapshots of our interiors, but pictures that show in “real time” the radical dynamism of our interiors (as represented by the before and after shots in Amen’s text). The result is a dynamic interface, or in Deleuze’s model, the double helix characterized by constant self-reflexivity. The interface is so precise, every "external" occurrence has an immediate "correlate," or effect on our interior composition. Thus the constant interrogation that goes back and forth between "exterior" and "interior": "Am I healthy? Am I experiencing signs of pathology? Am I producing pathological consequences?"

In this limitless self-reflexivity, the distinction between subject and object becomes dynamic and indeterminate. Foucault (1977) describes the fold as the figure of subjectivity that emerges when "man" becomes both subject and object of knowledge. The superfold animates this fold, suggesting the ceaseless indetermination that emerges as a general mode of being. In the next chapter, I continue this analysis of contemporary subjectivity, or biosocial modes of being. By examining popular media discussions of brain images and the knowledge about child care that they produce, I describe how this ceaseless reflexivity informs the care of others and gets taken up in social practices such as parenting and education.

CHAPTER FOUR

ARTICULATING NATURE AND NURTURE: BABIES, BLANK SLATES, AND BRAIN-BUILDING

Through imaging technologies, the brain has become thematized, or discursively produced, as something that is more than a biological organ. Because it can be *seen*, the brain has become an object of public attention, something that can be interpreted, manipulated and cared for through numerous interventions. This can be seen in the way that a host of social and cultural issues, ranging from divorce, women's role in the workforce, crime, musical appreciation, and economic competitiveness, are articulated via biological, specifically neuroscientific, vocabularies. This biosocial brain is a discursive "space" that brings together a wide range of political, economic and social issues, linking them according to their visible relationship to brain biology. The age-old "nature vs. nurture" dichotomy is no longer a legible opposition, because "nurture," or culture, is defined at the level of biology, and "nature" thoroughly infuses cultural practices and vocabularies.

The rhetorical consequences of the biosocial approached absurdity when, in January of 1998, Georgia Governor Zell Miller entered the state legislature with a recording of Beethoven's Ninth Symphony. After playing a few minutes of "Ode to Joy," he asked the lawmakers, "Now don't you feel smarter already?" (quoted in Moughty). Miller's dramatics were in support of his request that the legislature approve $105,000 to produce and distribute a classical music CD to parents of newborns throughout the state. Miller cited brain science research that indicated that listening to classical music enhanced mathematics and spatial reasoning abilities in newborns. In the end, however, the allocation was unnecessary as Sony agreed to provide the CDs free of charge, and by that summer, parents of newborns in Georgia left the hospital with complimentary Mozart recordings.

Miller was alternately praised and mocked for his “Mozart for Babies” initiative. Regardless of the political fallout from this particular incident, however, the event was part of a much larger trend of attention to babies’ brains and the intersections of neuroscience and public policy. Miller’s proposal came about four years into the “Zero to Three” phenomenon, a loose affiliation of scientists, child advocates, celebrities and politicians who insist that the first three years of an infant’s life are crucial for the child’s brain development and thus their future identity and behavior, as well as the fate of society as a whole. The attention to baby’s brain continues to escalate, and is manifested in government-sponsored conferences, public awareness campaigns led by celebrities, popular media attention, and the explosion of products marketed to parents and educators, ranging from books and CDs to toys and clothing, that promise to aid in the task of “building” good baby brains.

What is remarkable about the baby-brain movement is how an enormous range of social practices is articulated as a neuroscientific issue. In the Carnegie Foundation’s highly influential 1994 report, “Starting Points,” the authors discuss unplanned pregnancies, the growing number of women in the workforce, divorce and the rise of single-parent families, poor child care, teenage delinquency, poverty, illiteracy, and the decline of “human capital” for the national workforce as issues directly related to neuroscience and informed by brain imaging evidence. In his keynote address at the 1997 White House Conference on Early Child Development: What New Research on the Brain Tells Us About Our Youngest Children, actor Rob Reiner states that the zero-to-three theory is a way of “problem solving *at every level of society*” (1997, emphasis mine, quoted in Bruer, 1999). Focusing on the child’s brain during this critical early period will have a positive impact on “children’s success in school and later on in life, healthy relationships, but also an impact on reduction in crime, teen pregnancy, drug abuse, child abuse, welfare, homelessness and a variety of other social ills” (Reiner, 1997, quoted in Bruer, 1999).

As a discursive space of articulation, the baby’s brain brings together the personal and the political, the individual and the social. In Foucault’s (1991a) terms, the baby’s brain is a crucial site for practices of *governmentality*, or the conduct of conduct. An analytics of government provides a way of talking about the function of power at the level of practice in contemporary, postdisciplinary society. A key thematic is that ethics, or the conduct of oneself, becomes intimately linked to politics, or regulation at the level of the state. Governmentality is a framework for understanding the function of power as it simultaneously operates at the level of the government, the local community, the family and the individual. Politics, in this sense, extends far beyond the reaches of the state. Moreover, the examination of governmental rationality (Foucault’s shorthand is governmentality) attends to the relations between ways of *speaking true* and technologies of power, or the relationship between ways of distinguishing true and false and ways of governing oneself and others (see Foucault, 1989, 1991b, p. 82).

In the contemporary biosocial era, biological discourses have become the, or at least a, privileged mode of speaking true. In other words, neuroscience is recognized as a truthful discourse, not only when it is enunciated by scientists, but when it is used by individuals in their daily lives. From the perspective of governmentality, the proper question then becomes, what modes of conduct, technologies of the self and other, and social interventions are authorized through this truthful discourse? This question of authorization is not confined to the exercise of state power: governmentality is conceived as an alternative vocabulary to the theories of sovereignty and disciplinarity, useful for describing power as a constitutive force that is dispersed throughout the social field. In this chapter, I take up this question of the relation of truth and practice through an examination of the baby-brain discourses. In this chapter, I describe the way that neuroscientific discourse constructs baby's brains as objects of social intervention, authorizing a host of practices ranging from constant monitoring by family members to federal education programs. These wide-ranging practices exemplify a key characteristic of governmentality: a basic continuity in the exercise of power at different levels of society that links ethics to politics.

I will examine the baby-brain discourses through an analysis of *Time* and *Newsweek* cover stories from the past decade. The baby-brain discourses are built around a dialectic of permanence and malleability that is articulated through two major sets of tropes: mechanistic metaphors, including "wiring" and computer analogies, and the concept of "windows of opportunity," or critical periods that define early child development. This dialectic supports the distribution of social practices, including monitoring, both of the self and others, diagnosing, and intervention. These social practices, I argue, evidence a particular mode of subjectivation, or way of understanding one's relation to oneself and others. This mode of understanding entails specific practices on the part of individuals, communities, and state agencies. After analyzing the baby-brain discourses in major news magazines, in the next chapter I describe the surrounding controversies associated with related childcare and education policies and attend to the particular qualities of scientific discourse in the context of the biosocial.

Time, Newsweek, *and the Baby-Brain Rhetorical Formation*

Child development has always been a controversial public issue, with the pendulum regularly swinging back and forth between nature and nurture. In the 1990s, however, a "paradigm shift" introduced the language of neuroscience to the discussion (Zigler, Finn-Stevenson, and Hall, 2002, p. 2). Brain imaging, according to Zigler, Finn-Stevenson and Hall, "fundamentally changes the way we view our children and ourselves" (3). Brain imaging research is generally used to support the "zero-to-three" theory, or the belief that the first three years of a child's life are critical to shaping its brain, which will then come to determine its attitudes, behaviors and experiences in later life. The zero-to-three theory is traced back to a 1994 Carnegie Report, "Starting Points," that describes a "quiet crisis" in which children under the age of three "are in trouble, and their plight worsens everyday." The Report cites brain imaging studies that suggest that the first three years are critical to child development. During this time period, brain development is "much more vulnerable to environmental influence," and this influence is "long lasting." The environment affects both the number of brain cells and the way they are "wired" into connections. The Report concludes by calling for a bevy of social policy changes, ranging from family values to federal programs.

The baby-brain discourses constitute a rhetorical formation that is highly intertextual, and includes the websites of nonprofit organizations, the public campaigns of celebrities, government pronouncements, and an array of media attention. For instance, the Carnegie Report inspired actor-director Rob Reiner to develop a national public awareness campaign, creating the I Am Your Child Foundation. The Foundation is involved in a number of publicity campaigns. Many celebrities, including Whoopi Goldberg, Tom Hanks, and Robin Williams, have been involved with the Foundation's projects to gain publicity for issues related to children's neural development. The Foundation is probably best known for its videotapes featuring celebrities who address parents about basic childcare issues. One of the videos, for instance, is entitled "The First Three Years Last Forever." Reiner also led a 1998 campaign to get Proposition 10 passed in California, legislation that increases the state tax on tobacco products to fund early childhood development programs. Other states have been involved in similar initiatives to support early childhood development in the wake of the baby-brain enthusiasm. Reiner was one of the keynote speakers in 1997, when the White House held a conference commonly referred to as the "baby-brain summit," hosted by the Clintons. At the summit, scientists, educators, doctors, parents, and politicians met to discuss early childhood and strategize ways of increasing public awareness and improving the effectiveness of interventions to ensure proper baby development.

One of the most important distribution points in the baby-brain rhetorical formation is the media. Wendy Cole describes the consequences of the "media blitz" of a cause embraced by celebrities and schoolteachers alike: "Every new mom I knew was rushing out to buy the latest in high-contrast black-and-white toys purported to stimulate neurological development" (1998, p. 88). Steven Hall of the *New York Times Magazine* writes that the media attention to baby brains has resulted in "a neurotic national pastime: Raising a scientifically correct child" (quoted in Bruer, 1999, p. 52). In their analysis of media coverage, Zigler, Hunt-Stephenson and Hall conclude that brain-based child development stories "do seem to have caused a shift in how parents perceive both the nature of early development and their role in fostering it" (2002, p. 193). Surveys in conjunction with the White House conference suggest that 92% of parents believe that experiences before three will influence children's success in school; 85% believe that without appropriate stimulation, children's brains will not develop properly, and 60% responded that they were extremely or very interested in learning more about brain research (Bruer, 1999, p. 52). The media coverage has found a "large and receptive audience," influencing selection choices for news and feature coverage (Bruer, p. 53).

I have selected two cover stories from *Newsweek*, and two special issues for analysis, one from *Time* and one from *Newsweek*. There is evidence that these texts are particularly important nodal points in the baby-brain rhetorical formation and, in addition, they are appropriate touchstones for analysis because they interact with other elements of this larger formation by referencing events and quoting sources who are involved in this conversation. The first story is Sharon Begley's cover story for the February 19, 1996 issue of *Newsweek*, entitled "Your Child's Brain: How Kids are Wired for Music, Math & Emotions." Begley's article "brought the new brain science and its potential implications for early childhood to mainstream America and the world" (Bruer, 1999, p. 47). The public reaction to the article was "overwhelming," Bruer reports, as *Newsweek* received more reprint requests for the article than for any articles it had previously published (p. 48). The issue was the second-best seller of the year, beat out only by the Easter issue. The success of this story eventually led *Newsweek* to publish a special issue in 1997, titled, “Your Child: From Birth to Three.” Reiner and the I Am Your Child Foundation assisted in the development of the issue. It was a “massive success,” selling around 1 million copies with many overseas sales (Bruer, 1999, p. 51). It went through several printings, “and news vendors could not keep it in stock” (1999, p. 51). The other *Newsweek* story selected is the more recent “Your Baby’s Brain” (2005). The issue appeared to be a popular one, as evidenced by *Newsweek’s* reports of a massive response in the form of mail. In addition, I examine an issue of *Time* magazine (1997), titled “How a Child’s Brain Develops and What It Means for Childcare and Welfare Reform.” Not only are these cover stories significant in terms of their widespread circulation, they are also representative of the baby-brain coverage that appears in news magazines, television shows, and national newspapers.

Child development has always been a hot topic, so the prominence of the baby-brain research in public discourse is not difficult to understand. This is a topic that hits home with Americans, especially parents, and Bruer (1999) estimates that parents constituted a majority of the consumers of the *Time* and *Newsweek* cover stories. The baby-brain discourses are popular in part because they foster both a sense of guilt and a sense of control that perpetuate consumption of these discourses. On the one hand, these discourses generate guilt and anxiety in parents by fostering fear that they not doing enough, or doing too much of the wrong thing, and compromising their child’s future. Simultaneously, the discourses generate a sense of hope, or control, by telling parents that their actions have enormous influence for their child’s future development, and that they can bring about desired outcomes with the right information and the right products. Both of these responses are likely to promote a demand for additional information on the topic. In the next section, I examine how two central tropes structure a dialectic of permanence and malleability, contributing to this ambivalent construction of guilt and hope.

The Baby's Brain: Wired and Windowed

Although the zero-to-three theory is contested in the baby-brain discourses, what is taken for granted by all participants in the debate is that neuroscience research should inform public policy and should guide caretakers, including parents and educators, in their daily interactions with children. For instance, Mathew Melmed, Executive Director of the nonprofit organization *Zero to Three*, writes to *Newsweek*: "What parents need is guidance on how to apply all this new knowledge to support their child's development through everyday interactions" (2005, p. 18). In a *Time* cover story challenging the zero-to-three theory, Jeffrey Kluger and Alice Park suggest that science actually indicates that parents need to "relax" and pay more attention to emotional attunement and positive social interactions with their children, and less attention to the latest products marketed by zero-to-three-influenced "hucksters" (2001). Even the critics largely accept the assumptions and the terminologies that define the zero-to-three discourse. Two clusters of tropes constitute this rhetorical configuration: mechanistic or technological metaphors, which describe the infant's brain as something that is "wired," and the ubiquitous discussion of "windows" and critical periods.

Early child development has long been a locus for "nature vs. nurture" controversies: do children develop based on biological predeterminations, or are they molded by social influence? Today, the mantra is that nature vs. nurture is passé, because it is clear that both nature and nurture play important roles in human development. These clusters of metaphors are different ways of describing the interactions between natural and cultural agency, articulating the infant's brain as the product of particular combinatory principles. The two tropic groupings alternately privilege the malleability, or plasticity, of the infant brain, suggesting that social agents have substantial control, and the permanence of emergent biological structures. The movement between plasticity and permanence supports a number of social practices specific to biosociality, procedures that can be described using Foucault's terminology of governmentality.

Metaphors and Images

Scientific language is, in one perspective, a series of metaphors that draws on culturally relevant discourses to understand natural phenomena (Haraway, 2004; Sternberg, 1990). Condit (1999a), for instance, argues that metaphors are key components of scientific rhetorical formations, and she traces metaphors of genetics throughout the public vocabulary. Metaphors in public discourse are deeply influenced by context, and both the selection and the meaning of metaphors are dependent on contingent cultural and historical features (see Condit, et al., 2002). Steven Montgomery writes that the force of metaphors "lies in their ability to create images or even whole image systems" (1996, p. 137). Throughout the baby-brain discourses, the imagistic verbal metaphors operate in the midst of a variety of visual images. These visual elements are important contextual features of the baby-brain discourses and, in some cases, have a more important role than the verbal features of the text. As I describe the three sets of verbal metaphors that define this discourse, I will refer to the three major categories of visual images that accompany this copy: images of babies, functional images of babies' brains, and finally, charts and diagrams. These visual elements rarely appear alone and in most cases, all three visual features appear in some type of combination and in some instances, juxtaposition.

Technological Metaphors: Wiring the Baby's Brain

Ever since Descartes compared the human body to a clock, mechanistic metaphors have been ubiquitous in scientific discussions. The invention of the computer added a new set of terms to the scientific repertoire, providing scientists of the mind with a handy vocabulary for describing seemingly intangible processes by way of the concrete. Donna Haraway argues that the major movement defining the "paradigm shift" in the life sciences in the past century is "an effort to deal with systems and their transformations in time," utilizing mobile and dynamic metaphors to describe the function of living systems (2004, p. 17). The neuroscience discourses draw on a series of technological metaphors that capture, to some degree, a sense of movement and process. This set of vocabularies is centered around the notion of "wiring" the brain.

The wiring metaphors are used as an extension of, and sometimes in combination with, computer metaphors. At birth, certain parts of the baby's brain are "hard-wired," or already determined by nature. Other parts exist as an indeterminate mass of neurons that have not been arranged into a functional structure. Cultural influence creates and reinforces connections (synapses) amongst these neurons, effectively "wiring" the brain into a determinate structure of organized circuits. The wiring metaphors enable ambivalent meanings about the respective roles of natural and cultural influence. Although parts of the brain are hard-wired, and determined by nature, cultural agency seemingly has wide berth in wiring the rest of the brain. However, cultural forces must tread carefully because once the brain is wired, it is wired for good and becomes a permanent biological structure that controls the rest of the child's life.

In her 1996 *Newsweek* cover story, "Your Child's Brain," Begley describes the wiring of the baby's brain by way of a computer analogy. Babies come into the world with a "jumble of neurons," some of which are "hard-wired" into circuits that control breathing, heartbeat, and other basic motor functions (Begley, 1996, p. 56). Most neurons, however, are not:

> Trillions upon trillions more are like the Pentium chips in a computer before the factor preloads the software. They are pure and of almost infinite potential, unprogrammed circuits that might one day compose rap songs and do calculus, erupt in fury and melt in ecstasy. If the neurons are used, they become integrated into the circuitry of the brain by connecting to other neurons; if they are not used, they may die. It is the experiences of childhood, determining which neurons are used, that wire the circuits of the brain as surely as a programmer at a keyboard reconfigures the circuits in a computer. Which keys are typed—which experiences a child has—determines whether the child grows up to be intelligent or dull, fearful or self-assured, articulate or tongue-tied. Early experiences are so powerful, says pediatric neurobiologist Harry Chugani of Wayne State University, that "they can completely change the way a person turns out" (1996, p. 56).

The description of neurons as Pentium chips that are "pure and of almost infinite potential" taps into longstanding beliefs about the purity and innocence of childhood. Despite scientific aversion to the "blank slate" doctrine (see Pinker, 2002), an element of this doctrine persists in the technological metaphors of brain wiring. Descriptions of the infant's brain construct its purity and "infinite potential" by emphasizing the sheer quantity of neural cells. Madeleine Nash writes that at birth, "the baby's brain contains 100 billion neurons, roughly as many nerve cells as there are stars in the Milky Way" (1997, p. 50). This emphasis on quantity depicts the infant's brain as simultaneously unlimited and biological. "Nature" theories are often thought of as more limiting than nurture theories, because they suggest that identity is constrained by biology. The description of "trillions and trillions" of neurons makes nature something that is itself infinite, a type of "unprogrammed" tabula rasa of neurons. The blank slate is replaced with the unprogrammed computer that has not yet been "wired" into the circuits that will then determine its functions.

The computer metaphor enables a complex interaction between natural and cultural agencies. The unprogrammed brain exists as passive matter, awaiting the imprint of form from active cultural agencies. Once these circuits are formatted, however, they become the forces that determine the computer's functions. Once a computer is programmed, its function is determined by its wiring, or circuitry. The stark contrast between the possible programming outcomes is illustrated by the description of extremes: the child can experience "fury" or "ecstasy," its neurons can become "integrated" and "connected," or they can "die," the child can become "intelligent or dull," "fearful or self-assured," or "articulate or tongue-tied." These oppositions, and the added emphasis that early influences can "completely change" a child's future, retain elements of a biological determinism, or "nature" perspective. Once the biological circuits are "determined," the child's fate is pre-ordained. In this sense, biology truly is destiny.

This construction of opposites not only emphasizes the permanence and power of the child's biology, it also attests to the power of cultural agency. Biology might determine whether a child is a failure or a success as an adult, but this biology is itself determined by cultural influence. Experience is analogous to a computer programmer, the agent who establishes and orders the connections that will later determine the functions and behaviors of the machine. The description of a programmer who systematically and rationally sets out this circuitry by typing the appropriate keys suggests that this cultural agency functions according to an accessible cause and effect logic. Bruer suggests that these metaphors are why the baby-brain discourses appeal not only to women, but also to men. Men are attracted to the mechanistic construction of child development as something logical and systematic (Bruer, 1999, p. 49-50).

Two common alternatives to computer "wiring" are the telephone "wiring" and the "electrical" wiring metaphors. The developing nervous system "has strung the equivalent of telephone trunk lines between the right neighborhoods and the right cities. Now it has to sort out which wires belong to which house, a problem that cannot be solved by genes alone" (Nash, 1997, p. 53). Connections are formed through experience, as connections that are used are reinforced and those that are neglected die off and wither away. The process of forming connections is like "teenagers with telephones, cells in one neighborhood of the brain are calling friends in another, and these cells are calling their friends, and they keep calling one another over and over again" (48). For calls that are made frequently, the paths are preserved as the connections become myelinated, covered with a white, fatty substance "that coats nerve cells like the plastic insulation on telephone wires" and keeps signals on track and prevents "cross-talk" (Wingert and Underwood, 1997, p. 14).

The telephone metaphors situate the baby's brain as a dispersed set of "neighborhoods," or different areas with different functions that must coordinate in order to function properly. This metaphor is linked to the localization hypothesis that views the brain as an array of discrete functions, rather than a homogenous unit. The emphasis on spatial distribution functions with the descriptions of the neural galaxy to produce an understanding of the brain as a series of combinations, or connections that are formed though communication. Just like telephones appear to ameliorate distance and bring dispersed individuals into what seems like immediate contact, brain signaling similarly eliminates the space of the brain through signaling processes. The brain is not a "thing," but a set of combinations or interactive dynamic functions. The functional brain images reinforce this perspective. These images are colored representations of brain activity, and they are very different from images of the "wet brain" that can be found in older scientific texts. While the wet brain looks like a single organ, the functional brain images show a dynamic grid of activity with different shadings that suggest an ability to change given a simple alteration in stimulus. The functional brain images look more "real" or authentic than images of the wet brain, which have little ability to suggest the almost magical processes associated with the organ.

Communication between neighborhoods in the brain depends on proper signaling systems, and these are formed in practice as linkages biologically preserved because of their frequent usage. This communication metaphor is tied to the biological theory that neurons communicate across synaptic gaps through electrical and chemical means. The idea of a message being encoded and transmitted across long distances through telephone wires is close to the idea of electrical signals transmitted throughout the brain. The electrical connections that are formed are often described through auditory language. Hancock and Wingert begin their article on brain wiring, “Listen to the snap, crackle, pop of baby neurons” (1997, p. 36). Barbara Kantrowitz similarly writes, “Every lullaby, every giggle and peek-a-boo, triggers a crackling along his neural pathways, laying the groundwork for what could someday be a love of art or a talent for soccer or a gift for making and keeping friends” (1997, p. 7).

These wiring metaphors suggest that the linkages or connections are formed through social experience *immediately*, in the instant it takes to hear another’s voice on the line. Social agency constantly produces biological effects, and there is no temporal gap in between the stimulus and the wiring response. Brain imaging is frequently cited as evidence of the coincidence of stimulus and response. Begley writes:

> You cannot see what is going on inside your newborn’s brain. You cannot see the electrical activity as her eyes lock onto yours and, almost instantaneously, a neuron in her retina makes a connection to one in her brain’s visual cortex that will last all her life. The image of your face has become an enduring memory in her mind. And you cannot see the explosive release of a neurotransmitter—brain chemical—as a neuron from your baby’s ear, carrying the electrically-encoded sound of ‘ma,’ connects to a neuron in her auditory cortex. ‘Ma’ has now commandeered a cluster of cells in the infant’s brain that will, as long as the child lives, respond to no other sound. You cannot see any of this. But Dr. Harry Chugani can come close. With positron-emission tomography, Chugani . . .

> watches the regions of a baby's brain turn on, one after another, like city neighborhoods having their electricity restored after a blackout (1996, p. 28).

Chugani can "measure" brain activity, and "observe" the cortex "burn with activity" and "light up" as experiences "determine the actual wiring" of the infant's brain (29-30).

These visual vocabularies are accompanied by two images of PET scans, clearly marked as different by their contrasting colors (one is primarily blue while the other is primarily red) and by the labels "Healthy Brain" and "An Abused Brain" (30-1). The color scale indicates to the reader that the healthy brain, the red brain that is "glowing," or "lit up," shows high activity while the blue brain is low activity, evidence of "extreme deprivation." These visual vocabularies and the accompanying images suggest that brain imaging provides science with moment-by-moment access to the brain, and that the effects of a particular stimulus can be observed instantly. The wiring process is instantaneous, but the effects are long-lasting. The actual wiring is "determined," and the connections described above will last the entirety of the baby's life, enduring memories for "as long as the child lives." Sight, in this case, provides not only constant access that shows that social stimuli have immediate effects, but is taken as something that accesses "nature" as something with permanent, enduring and immutable qualities. The brain images are thus ambivalent: they are used as evidence of both the susceptibility of the brain to cultural influence, and they are also used as a representation of a "natural" referent, invoking the qualities of permanence and immutability associated with biological determinism.

Not only are the effects of social stimuli instantaneous and permanent, they can be brought about through the most casual interactions. The wiring process happens literally in the blink of an eye: speaking a particular word, touching in a particular way, even once, can have lasting effects. If the brain is a blank slate, it does not take a heavy hand to mark it permanently. As Kantrowitz's story states, "every" lullaby, "every" interaction, solders connections affecting the structure of the brain for life. The consequence is that it is possible to build a baby's brain inadvertently. Debra Rosenberg writes in *Newsweek*, "Parents may be unintentionally sending signals from the start, or deliberately shaping the most crucial messages" (1997, p. 92). The metaphor of the computer, where the brain is affected by every keystroke, is supplemented by the telephone and electric circuitry metaphors that suggest that connections can be made immediately and unintentionally. If the wrong stimulus is presented at the wrong time, it is akin to dialing a wrong number: the circuit is still activated, even if it was an accident. This undercuts the agency implied in the mechanistic metaphors, or the discussions of "building" a baby's brain. Social influence is substantial, but it is not governed by intentionality. Chance and accident are just as likely contributors to the wiring process. A single incident, such as a mother who screams at her child, or a father who arrives home drunk and beats his child, can create pathways with lasting effects ("the mere memory of Dad may induce fear") (Begley, 1996, p. 58).

The wiring metaphors interact with the images of babies in contact with imaging technologies. The recent *Newsweek* cover, for instance, features a white, blue-eyed baby, gazing in marvel at the wires that dangle from the geodesic sensor net attached to its head. The net consists of a number of small "suction cups" that are designed to measure the electrical activity of the brain. The image combines a socially ideal (white, blue-eyed, curious, healthy) baby with technology that has a "science fiction" connotation: a net of wires connected to the head, suggesting a certain spillover between baby and machine. This image combines the innocence of childhood, with its representation of a perfect baby, and the promises of biotechnology. The baby appears contented, even fascinated, by the geodesic sensor net, suggesting that the imaging technologies are truly noninvasive. The sensors attach to the baby's head, but they do not penetrate its skin. The baby remains intact, despite the revelations that are enabled by the net. In this image, the baby is in part a synecdochal representation of humanity, and more specifically, the capacities of the human mind, in general. The brain imaging technologies promise to reveal the meaning of the mind, something that is as mysterious and elusive as babies.

Taken together, the wiring metaphors suggest a complex interaction between nature and nurture. At birth, the infant is partially determined (hard-wired) by nature. The rest of the infant is passive matter, a jumble of potential connections, ready to be wired into a circuit. From there, social agency takes over, establishing connections through interactions. Social agency is not unbound, however. Nurture must follow the hidden rules of nature, providing the right influence at the right time to establish connections that will produce a good child. To fall short of this hidden guide, to establish connections through accident, caprice, or error, is fatal: literally, to the neurons that will die, and metaphorically, to the opportunity to "build" a successful (or normal) child. What counts as success or normality from a biological standpoint is ultimately judged only by its social manifestation: if the child turns out to be dull and inarticulate, it is inferred that the child's brain was not properly wired (not exposed to the right influences) during its first three years. As I will explore in more detail later in this project, nature is a normative discourse, but this normative function is expressed through social or cultural vocabularies.

Timing is Everything: Critical Periods and Windows of Opportunity

The combination of natural and social agencies that “wire” the infant brain is structured by a strict temporal logic described in the rhetoric of “windows of opportunity,” “milestones,” and “critical periods.” These are time windows when the brain is receptive to acquiring certain types of information, and needs specific stimuli during these periods in order to develop properly. The baby’s brain is wired during the first three years of its life, but these three years are subdivided into a number of different time periods during which appropriate social influences are critical. These windows are described throughout the baby brain discourses, both in textual accounts and in numerous charts, checklists, and timelines for tracking proper infant development across the critical periods in the first three years. The metaphor has three important connotations. First, the critical periods are windows of access, providing an opening during which parents can shape and control the brain through appropriate stimulation. Second, they are windows of opportunity, in the sense that they are “once in a lifetime” chances to get things right. In this sense, they are windows that can be shut permanently, potentially signaling missed opportunities. Finally, the language of “windows” is a visual metaphor that works in tandem with the visual images of the brain produced by technologies that are themselves frequently described as “windows.”

The “windows” metaphor situates these time periods as crucial because, like windows, they can be closed. Once the windows are closed, the wiring is in place and the future course is set. Begley describes, “Yet, once wired, there are limits to the brain’s ability to create itself. Time limits. Called ‘critical periods,’ they are windows of opportunity that nature flings open, starting before birth, and then slams shut one by one, with every additional candle on the child’s birthday cake” (1996, p. 56). The stark description of windows “slamming shut” suggests that the time period is strictly defined, and a missed opportunity is missed forever. The consequences of a missed window can be devastating. Nash writes of brain imaging studies that show that the “emotional tone” of exchanges between mothers and their children determines the difference between the child’s later emotional intelligence. The studies found that “mothers who were disengaged, irritable or impatient had babies with sad brains” (1997, p. 55). Timing is everything: for a short period, the baby’s brain is “forgiving” and emotional damage can be repaired: “If a mother snaps out of her depression before her child is a year old,” brain activity picks up (p. 55). If the mother remains depressed, then the window is lost. The baby’s first years are marked by “critical or sensitive period,” “when the brain demands certain type of input in order to create or stabilize certain long-lasting structures” (p. 55).

These biologically defined timetables have two major discursive consequences. First, they construct the baby’s brain as extremely vulnerable. The “open windows” make the baby’s brain a sponge of sorts, where it can be permanently affected by any exposure. Any stimuli, accidental or intentional, can potentially have adverse consequences for the baby’s life. Second, the window metaphors define infant brain development as something that is determined by biology but requires precisely timed social input to stay on course. If the right stimulus is not given at the right time, the baby’s brain is not wired according to nature’s plan. Nash’s article, for instance, describes nature and nurture as a “dance,” in which nature is the dominant partner, but nurture plays a vital supportive role (1997, p.

52). An absence of the necessary social “triggers,” or social interference of the wrong type can hijack the “clockwork precision of the neural assembly line” (p. 52). The consequences are permanent: Begley quotes Dr. Bruce Perry of Baylor College of Medicine. Children exposed to trauma and unpredictable stress, such as a mother’s boyfriend who lashes out in anger, will suffer permanent consequences: “Some percentage of capacity is lost. A piece of the child is lost forever” (1997, p. 32).

Other descriptions similarly use quantitative figures to express the consequences of improper stimulation. Nash reports that a child’s brain suffers when deprived of a stimulating environment, and is 20 to 30 % smaller than brains of normal children (1997, p. 51), and Begley also cites the 20 to 30 % statistics (1997, p. 32). The brains of deprived children also have “fewer synapses” (Begley, 1997, p. 32). The visual brain images contribute to this quantitative sense, depicting contrasting images of the healthy brain and the sick or “sad” brain that does not receive adequate simulation. The different shadings and areas of activity depicted suggest a proportional relation between three factors: the amount of good social influence, the size of the brain, and the future success of the child.

The baby’s brain, then, as “actively vulnerable,” or vulnerable not only to trauma but also to the *lack* of proper stimuli. Nature and nurture are locked in a dance of “tightly choreographed steps,” and if nurture fails to follow nature’s lead, tragedy ensues. The baby-brain stories are peppered with diagrams, checklists and charts that diagram this “dance.” In general, these diagrams communicate three major things. First, these diagrams illustrate what activities are expected, or “normal,” at which age. The 1997 *Newsweek* special issue includes several of these charts, including “Growing Up, Step by

Step," a series of step-by-step graphics that "track an average child's development from zero to three" (p. 26). For instance, readers learn that at 11 months, the baby "likes to turn pages, often not one by one. Fascinated by hinges and may swing door back and forth" (p. 27). Between 30 and 36 months, the child "rotates jigsaw pieces and completes a simple puzzle," and "tries out new types of movement like galloping and trotting" (p. 27). These types of step-by-step guides function as a checklist, allowing parents to track their child's development and compare it to the "average" child, watching for symptoms of abnormal development.

The second thing that is communicated in these diagrams is what interventions are appropriate at what time. The 2005 *Newsweek* cover story includes a diagram entitled "Milestones" that is for parents to "help track [their] baby's progress in relating to others, along with activities to help him meet these targets" (2005, p. 36). The chart has three rows, dedicated to "emotions," "social skills," and finally, "helpful games," a list of interventions that will help to assure proper emotional development (36-7). For a baby of 5-6 months, for example, the parent should "use words and funny facial expressions to get [the] baby to break into a big smile" (36). Throughout these articles, the diagrams range slightly in terms of format, focus, and specificity. They are all designed, however, to provide a foundation for tracking infant development as well as to prescribe appropriate types of influence for each critical period.

The final communicative function is to make readers literate in the language of neuroscience, enabling parents to use biological vocabularies to understand and interpret their child's development. A ubiquitous feature of the diagrams is visual representations. The articles often include diagrams of the baby's biological brain, allowing readers to connect the critical period, the appropriate functions for that period, and the exact area of the brain that is responsible for those functions. The 2005 *Newsweek* article features a photograph of a smiling baby, with a diagram of brain biology overlaid on the baby's head. The relevant areas are highlighted and an arrow connects the area to textual description. The diagram identifies the "dorsolateral prefrontal cortex," for instance, and tells readers, "This area may help babies remember people and things that aren't there. Once it's developed, babies can suffer separation anxiety over absent parents. Sees big gains after 8 months" (p. 37). In some cases, these descriptions reference imaging studies. For instance, the discussion of the "left temporal lobe" states, "Brain scans: From as early as 9 months, differences in temperament are reflected in brain activity. Shy babies show heightened activity in their left frontal lobes" (p. 37).

The metaphors of wiring and windows function to divide natural and cultural agencies through temporal terms. The first three years of life are marked into "critical periods," temporal boundaries that illustrate normative natural development and provide a framework for precisely timed social interventions. The metaphor of "wiring" suggests that once neural connections are established, or linked by way of social interaction, they are then determined as a stable, permanent structure. The control of cultural influence is total in its consequences but not in its intentionality. It can make the difference between a successful child and a child with severe physical, emotion and cognitive problems, but culture cannot rationally ordain desired outcomes. The first three years are governed by precise rules of timing that are only partially accessible to cultural agents. Virtually every experience, intended or accidental, can permanently wire the brain. Brain imaging research can access these rules of timing, but a child's brain cannot be permanently imaged throughout its first three years. To substitute for this scientific vision, depictions of babies in electrode caps or babies and MRI machines remind readers that every baby has a wealth of data in its interiors. Because it is not practical to image every baby's brain all the time, parents can partially substitute for vision by adopting a precise neuroscience vocabulary and attending to the behavioral details that are constructed as potential symptoms or evidence of maldevelopment. In the next section, I will continue this analysis, describing how the images and metaphors of wiring and windows construct a number of social technologies.

Technologies of Intervention: "Building" a Good Baby Brain

The 1994 Carnegie Report, in many ways the starting point of the American obsession with babies' brains, describes the problem in stark terms: "Our nation's children under the age of three and their families are in trouble, and their plight worsens every day." The good news is that "given sufficient focus and sufficient political will, America can begin to find its way toward solutions. Our nation can formulate and implement social policy that responds, over time, to the most urgent needs of our youngest children." Children under the age of three "need our help," "and we, as a nation, have an incalculable stake in their well-being." As these excerpts illustrate, the problems of early child development are defined as biological or neuroscientific problems, but they are also social problems that affect the entire nation. Responses to the threat of biological maldevelopment must come not at the level of individual biological remedy, but at the level of national policy-making and social action.

There are two features of governmentality which are important here. First, governmentality involves the dispersal, or distribution, of practices of government. A sovereign does not exercise power over a determinate people, or a set of individuals with an a priori identity, nor do institutions, such as the prison, school or asylum, function as clearly demarcated sites of governance. With governmentality, “the conduct of conduct takes place at innumerable sites, through an array of techniques and programs that are usually defined as cultural” (Bratich, Packer and McCarthy, 2003, p. 4). A defining aspect of governmentality is interiorization. Practices of regulation are dispersed throughout society, outside of even institutions, and taken up by each individual. In the case of the baby discourses, monitoring and diagnosis are functions of constitutive power exercised outside of any institutional domain by parents and caregivers. Monitoring and diagnosis still occur in settings such as the hospital, or the physician’s office, but they also occur in the home and in the school. The key here is that the functions (monitoring, diagnosis) are *detached* from any necessary relationship with an institutional space.

The second feature follows from the first. Operations of power, or governance, are dispersed, but power operates in a relatively continuous fashion at the level of the state, the institution, the community, and the individual. The study of governmentality demands an attention to “the very situations in which the regulation of personal conduct becomes linked to the regulation of political or civic conduct” (Dean, 1996, p. 220). Political and nonpolitical spaces become linked. Nikolas Rose gives the following examples:

> In the name of public citizenship *and* private welfare, the family has been configured as a matrix for organizing domestic, conjugal and child-rearing arrangements and instrumentalizing wage labour and consumption. In the name of social *and* personal wellbeing, a complex apparatus of health and therapeutics has been assembled, concerned with the management of the individual and social

> body as a vital national resource, and the management of "problems of living," made up of techniques of advice and guidance, medics, clinics, guides and counselors (quoted in A. Barry, T. Osborne, and N. Rose, 1996, p. 37).

Rose's conclusion is that what counts as "politics" is not self-evident in this age of governmentality, but must itself be an object of analysis. In the baby-brain discourses, the most "private" modes of caring for the self, for instance the management of one's emotions in the home, become articulated with, or discursively linked to, public policy, including federally-funded programs that mandate family leave, fund preschool education, and reform welfare.

A few examples of the public policy initiatives that emerge from this discursive configuration will better illustrate these features of governmentality. The 1997 *Time* special issue on child brain development includes a graph that maps out what different states are doing to address the "quiet crisis." North Carolina, for instance, has "Smart Start," a program in which "parents, teachers, doctors and nurses, child-care providers, ministers and businesspeople form partnerships at the county level that set goals for the education and health care of children under six" (Collins, 1997, p. 60). The article quotes North Carolina Governor James Hunt, who relies on the "hard science" of brain imaging research to bolster his policy initiatives. He says of the sensitivity of babies' brains, "Now that we can measure it and prove it, and if it can be made widely known so people understand this, then they'll understand why their schools aren't going to work for them, their technical training isn't going to work, other things we do later on aren't going to work fully unless we do this part right and do this at the appropriate time" (in Collins, 1997, p. 60).

Other states similarly use “hard science” to support initiatives targeted at young children. Oregon has “Healthy Start,” a program that funds home visits to check up on child development. The article describes a 22-year-old mother who was told by a home visitor that she should start reading to her child immediately, not wait until she was two or three years old. Vermont has Success by Six, a program that visits a home within the first two weeks of the baby’s birth. The article quotes former Governor Howard Dean, “That gets us in the door at age zero instead of age five, so we can assess what families need” (in Collins, 1997, p. 62). In a letter to *Newsweek* in response to the 2005 cover story on baby brains, three professionals who work for Babies Can’t Wait, a federal- and state-funded program that provides a “free, full-developmental assessment for any baby, up to age 3”, describe their own initiative. They write, “If the baby is found significantly delayed in any area of development, he or she is plugged into a system that will provide a home-based early-intervention program to address specific goals for that child. We are identifying babies as early as a few weeks old who appear to have signs of emotional, sensory or behavioral problems” (Salzman, Carberry, and Hall, 2005, p. 18).

On the one hand, these interventions sponsored by federal, state and local governments appear to represent an intrusion of state power into the private sphere. What is key from the perspective of an analytics of government, however, is the ways in which the functions of power at the level of the state—early intervention, diagnosis, monitoring—merge with the functions of individuals, families, and other private actors such as physicians and caregivers. As North Carolina’s Smart Start program shows, the state is less the “owner” of power who intrudes in the lives of private citizens than a space of distribution or a mode of coordinating the free-floating mechanisms of regulation that are taken up by a diverse social agents. With governmentality, the state's role is "one that gathers together disparate technologies of governing inhabiting many sites" (Bratich, Packer, McCarthy, 2003, p. 5). The relation between the state and the citizen is not one of domination, or opposition, but one of enabling and assisting. As in Dean's quote, the government will assess what families *need*, responding to their desires for assistance. The policies that emerge from the baby discourses are "progressive," in the sense that they promote family leave and childcare, typically support more generous and less restrictive welfare policies, and fund educational initiatives. In short, they give money to "help" babies, children, and families. It is this "progressive" nature of the interventions that poses serious rhetorical challenges to the opponents of the "myth" of the first three years. In the next chapter, I examine the controversial aspects of the baby-brain discourses. Specifically, if neuroscience is a discourse for "speaking true" that authorizes technologies of government at every level of society (from politics to ethics, or the state to the individual), then what are the consequences for rhetorics of contestation?

Conclusion

In the previous chapter, I concluded my examination of brain-based self-help books by reflecting on the resulting mode of subjectivity as superfold, a figure of constant turning-back-on-oneself, a ceaseless self-interrogation that makes oppositions such as cause and effect, or interior and exterior, indeterminate. This chapter extends that analysis by examining how brain imaging discourses situate individuals in daily interactions with others, in social contexts such as the family and the school. These discourses have a similar function with regards to the construction of subject positions because the brains of babies are constructed as both the digital complement to the blank slate, open-ended potential that must be "wired" into fixed form, and as complex systems that demand precisely timed and predetermined interventions. Social actors, particularly parents and educators, are required to constantly interrogate how their moods and behaviors are permanently influencing babies' brains. This is not only an interrogation of the moods and behaviors that are enacted, but also the activities that are *not* produced. The failure to engage in an activity at the proper time can be just as detrimental as engaging in the wrong activity. The oppositions between nature and nurture become entangled in this "superfold" model that posits both malleability and permanence, both a *tabula rasa* ideology and the trappings of biological determinism.

In this rubric, babies' brains become a constant task, requiring both a care of others and a care of the self. As a constant task, these forms of care are modes of governmentality, or the conduct of conduct (see also Nadesan, 2002). The care of babies becomes a way to redistribute power from discrete institutional locales onto the continuous social field. Boundaries between institutions are broken down as each individual becomes responsible for exercising the functions of care and government in his or her daily practice. In terms of the biosocial, the "biologization" of society is accomplished by referencing all social activities to their neural causes and effects. Bad parenting causes bad baby brains, and bad (or unhealthy, or maldeveloped) baby brains cause bad societies. This biologization of the social field reconfigures its topography, bringing discrete spaces into seamless contact and weaving disparate functions into a single mode of care. This biosocial shift reconfigures social life, and it also has important consequences for public policy and scientific discourse, as I describe in the next chapter.

CHAPTER FIVE

BIOSOCIAL DISCOURSE IN PUBLIC POLICY: THE NATIONAL AGENDA OF BUILDING AMERICAN CITIZENS

Neuroscience is a powerful force for the transformation of society because, to borrow Rabinow's phrasing, it is becoming "embedded throughout the social fabric at the microlevel by a variety of biopolitical practices and discourses" (1998, p. 411). The neuroimaging discourses are scientific, but they do not function according to vertical models that ground their authority in a sphere external to social existence (for instance, objective nature). If, as Rabinow describes, biosociality is marked by a simultaneous becoming-cultural of nature and a becoming-natural of culture, then the rhetorical characteristics of science, the "voice of nature," will also exhibit alteration. In previous chapters, I have examined the transformation of scientific discourse when it is taken up into self-help books and popular media discussions of babies' brains. In this section, I turn to political, or public policy, discourse. There is considerable scholarship on the function of scientific argument in policy forums (e.g., Englehardt and Caplan, 1987; Farrell and Goodnight, 1981; Goodnight, 1982; Mitchell, 2000). Most of this scholarship follows the premise that science is a rhetorical "gold term," or a basis of persuasion that is both divorced from human and historical context and employed as an authoritative appeal beyond the limits of refutation or argument. What is striking about scientific rhetoric in a biosocial context, however, is that it does not function by way of an externally grounded authority but becomes a part of the social fabric. In this context, science becomes an omnipresent voice but this breadth of influence brings with it discursive accountability for its social "effects." In other words, in gaining an ability to speak authoritatively on all matters, science sacrifices its immunity from social responsibility.

In this chapter, I focus on Hillary Clinton's 1997 address at the White House Conference on Early Childhood Development and Learning: What New Research on the Brain Tells Us About Our Youngest Children, and Laura Bush's address at the 2001 White House Summit on Early Childhood Cognitive Development (in this chapter, I will refer to Hillary Clinton and Laura Bush as Clinton and Bush respectively, noting when I am speaking of their husbands). By engaging public addresses by a First Lady and former First Lady from competing political parties, I am better able to suggest what Foucault describes as a "history of the present," or an analysis of a time period not according to the divisions that *it* uses to define itself, but through the identification of discursive patterns that are shared by ostensibly oppositional political voices. As part of this rhetorical formation, I also engage other speeches given at the 1997 Conference and the 2001 Summit, as well as other public statements by Clinton and Bush regarding brain science and national childcare policy. After describing the Conference and the Summit, I situate my interrogation of "biosocial" scientific rhetoric in relation to previous studies of scientific discourse, especially in public policy contexts. I then identify the characteristics of this biosocial voice by attending to the shared rhetorical patterns exhibited by Clinton and Bush. I conclude by reflecting on the characteristics of controversy in the biosocial age.

Saving Our Most Valuable National Resource: The Brains of American Children

Brain images thematize and visualize the brain, constituting it as an object of individual scrutiny and national consideration. The brain imaging studies, described in the previous chapter, have focused attention on babies' brains, specifically the brains of children during their first three years of life. This scrutiny has turned babies' brains into national resources that must be cultivated and preserved by governmental policies. In 1997 and 2001, the White House—under the control of Bill Clinton and George Bush, respectively—organized national policy conferences devoted to integrating neuroscience research on babies' brains with legislative agendas. Hillary Clinton and Laura Bush were active leaders of these conferences, and each addressed their conference with a statement on the importance of focusing national attention on babies' brains.

The Clintons and the 1997 Baby-Brain Summit

In February of 1997, Bill Clinton called for a conference on child development and brain science in his State of the Union Address. The conference, called The White House Conference on Early Childhood Development and Learning: What New Research on the Brain Tells Us About Our Youngest Children, often referred to as the White House baby-brain summit, was hosted by Hillary Clinton on April 17, 1997. The event convened childhood development specialists and neuroscientists, as well as educators, politicians, and celebrities, and was designed to develop policies at the national and community level for enhancing brain development, particularly in the first three years of life. The conference was carried by satellite to approximately 100 sites around the country and was widely covered by the media. In a statement announcing the conference, Bill Clinton summarized its purpose, to "make the latest scientific research, nearly all supported by the Federal Government, more accessible and understandable to America's families"

(Clinton, “Statement,” 1997). According to Bill Clinton, “It will also explore how this information can be used by all members of our society—from corporate executives to pediatricians, from ministers to elected officials to help strengthen America’s families” (“Statement,” 1997).

In general, the conference was positively received. Beth Frerking writes that child advocates were pleased with the “unique opportunity to unite science with the everyday tasks of parenting and with public policy that affects children, from welfare reform to the quality of childcare” (1997, 12A). The Society for Neuroscience similarly applauded the effort, issuing a letter to the White House thanking the Clintons for making the public aware of “vital research findings that have such immediate and far-reaching implications for early childhood learning and the intellectual potential of future generations” (“White House Conference Melds Neuroscience and Public Policy,” 1997). The letter also lauded the melding of public policy and neuroscience, encouraging further efforts to recognize the “hope” that neuroscience will alleviate the extraordinary range of social problems stemming from early childhood.

The summit was designed not only to bring neuroscience research on children’s brains to public awareness and the legislative agenda, but also as a forum for the introduction of policy proposals. Zigler, Finn-Stevenson and Hall describe the host of legislative issues that are associated with the neuroscience of young children: they include early intervention and early education programs, nutrition during prenatal and early childhood years (including, for instance, WIC, the Women, Infants and Children program), health care and health insurance, family cohesiveness, day care, welfare reform, and family and medical leave policies (2002, p. 7-8). At the conference, Bill Clinton specifically referenced policies including the expansion of the Family and Medical Leave Act, work to give parents tools like the V-chip and television rating systems, and policies to prevent children from using drugs and alcohol. In addition, he described his support of the WIC program, Head Start, affordable childcare, welfare reform, national health insurance, and anti-violence programs such as Safe Start, all articulated as policies informed by research on child brain development.

The Bush Agenda: Good Start, Grow Smart and the 2001 Summit

Echoing his predecessor's address some five years earlier, in his 2002 State of the Union Address, President Bush called for national attention to early childhood learning and advocated programs for early intervention and education such as Head Start. George Bush was referencing the topics that had formed the basis of Laura Bush's July, 2001 conference, the White House Summit on Early Childhood Cognitive Development—Ready to Read, Ready to Learn. Bush's conference was less explicitly devoted to neuroscience, and framed as a conference mostly about education. The emphasis on cognitive development, however, indicates the powerful role that brain science played in shaping the topics and discussions of the conference. The conference featured an address by Patricia Kuhl, a neuroscientist and co-director of the Center for Mind, Brain and Learning. Kuhl described contemporary brain-imaging technologies, stating that "these new techniques are revealing, in a tangible way, how the brain really works," and providing a scientific basis for educational and social policies (Kuhl, 2001). Kuhl describes the purpose of the conference as addressing the "big gap between the neuron and the chalkboard" (2001).

In addition to this scientific tenor of the conference, President Bush and his administration have been vocal advocates of scientific approaches to education, incorporating references to scientific authority throughout the No Child Left Behind Act. The U.S. Secretary of Education Rod Paige co-hosted the conference with Laura Bush and the U.S. Secretary of Health and Human Services Tommy Thompson. Paige described the summit as “the first step in a long range and widespread effort to raise public awareness of the science and the need for early childhood cognitive development,” insisting on “a way to put the research and recommendations presented during the course of the summit to work in government programs for young children” (“White House Summit on Early Childhood Learning Concludes,” 2001). Paige stated, “We need to build a bridge between powerful scientific research, homes and preschools and make sure that adults know how vital it is that children have strong cognitive development, even before they enter school” (“White House Summit on Early Childhood Learning Concludes,” 2001).

The White House described the summit in strikingly similar terms used to describe the 1997 conference hosted by the Clintons situating the convention as a way to disseminate brain research to the larger public. A White House statement describes the burgeoning scientific research on children’s early cognitive development, emphasizing the problem, “Unfortunately, many homes and classrooms around the country do not have enough information to take advantage of the latest research” (“The White House Summit,” 2001). Thompson also used the summit as a forum for announcing policy initiatives, including a major federally-funded research effort to determine the most effective means of promoting cognitive development. In the project, Thompson describes, “Researchers will follow children from birth through kindergarten and beyond. They will identify children at risk for failure, and determine what programs will best prepare them for school” (2001). He lauds policies such as those in Wisconsin, “a comprehensive approach that does not compartmentalize education into one slot, health care into another, and the workplace into yet another” (Thompson, 2001). Through integration of these areas, a respect for “sound science” can lead to “real world” changes that will help the most important national resource, children’s brains (Thompson, 2001). Like Clinton, Thompson references health care, childcare, anti-poverty programs and welfare reform as policies impacted by research on babies’ brains that must be attended to for the good of the nation.

Despite being five years apart and the products of two administrations representing different political parties, the discourses that frame these conferences exhibit many shared patterns. In both cases, brain research is a mode of thematizing early childhood brain development as a national issue demanding policy intervention. A wide range of policy matters, from welfare and education to health care and anti-crime legislation, are brought together under the common rubric of children’s cognitive development. The child’s brain becomes a locus for the articulation of, or linking together of, a diverse array of legislative proposals and national concerns. This linkage is discursive, or rhetorical, in the sense that all of these issues become proper subjects for a conference in children’s brain development. This linkage is also, however, made at the level of policy: as Thompson’s statement indicates, the policies are designed to make connections between the realms of health, education, and parenting. The early intervention programs described in the previous chapter where, for instance, a health care professional might come into the home to ensure proper parenting and education, represent one example of this emphasis on seamless connections between institutions and their functions. Furthermore, in this articulatory movement, neuroscience becomes an authoritative discourse influencing this diverse arrangement of policies. If the general advocacy is the interconnection of diverse arenas by referencing them to childhood brain development, then the "glue" that solders these arenas into a single web is neuroscience research.

A Voice From On High: Scientific Privilege and the Authority of Nature

The function of scientific discourse in public or popular communication contexts is widely recognized by rhetoricians as a significant concern. In most instances, communication scholars are wary of scientific discourse, ascribing to it the function of authority without responsibility. Lyne and Howe have argued, for example, that scientific expertise is invoked as justification for authoritative statements in many areas of public concern: participants in public deliberation use "rhetorical license to invoke science while remaining insulated from technical criticism" (1990, p .145). Because science is thought to represent "for the ordinary person a language not of mankind but of nature," it enjoys an epistemic authority in public discourse (Lessl, 1989, p. 186). Science, in other words, is widely perceived as a *truthful* discourse, both within and beyond the scientific community. Alan Gross notes that the high esteem placed on science gives its communications "a built-in ethos of special intensity," (1996, p. 21) and Prelli (1989) argues that science is judged on its public image, not technical grounds. In short, in public discourses science is thought to function as a potent yet amorphous rhetorical appeal that denies precise refutation. In this view, opposition to what is done or said in the name of science can be easily dismissed as “political,” or motivated by something other than Truth. The danger, according to many critics, is that democratic discussion will be curtailed through the imposition of external scientific authority.

The function of science in policy arenas, or public argument contexts characterized by *deliberative* rhetoric, is thought to especially problematic. Thomas Goodnight states, for instance, “argument practices arising from the personal and technical spheres presently substitute the semblance of deliberative discourse for actual deliberation, thereby diminishing public life” (1982, p. 215). In more recent example, Gordon Mitchell takes science to task for its role in perpetuating an atmosphere of secrecy surrounding important national decisions. He summarizes:

> The perceived epistemic (and political) authority of science as a deliberative topos in public argument is rooted ultimately in the concept of objectivity. Advocates who can claim the mantle of objectivity successfully gain the upper hand in public disputes, by virtue of their ability to exploit the ethos of scientific research and to tie their arguments to favorable cultural assumptions about scientific practice. This maneuver is accomplished by drawing upon the tradition of science as a practice that produces knowledge out of the “view from nowhere” (2000, p. 15).

When the veracity of science is challenged, according to Mitchell, the state is set for public controversy. In these instances, the result is often a sharpening or a clarification of the boundaries of what constitutes legitimate science (see also Gieryn, 1983; Lessl, 1988; Taylor, 1991).

There are three important assumptions about the function of scientific discourse in public argument that characterize these treatments. First, the model of communication is a *vertical* model, one in which science and society are conceived as distinct realms with science standing outside of, and above, society. Science draws its authority from its origination in a sphere external to, and higher than, society. Lessl makes this assumption explicit when he describes the public voice of science as "priestly," a rhetoric that is "largely vertical, descending from above as an epiphanic Word, filled with mystery and empowered with extra-human authority" (1989, p. 185). Second, in these critical accounts of the public argument of science, these scholars typically pinpoint the overextension of science as the source of problems. Mitchell condemns science's secrecy, writing that this tendency "frays the fabric of democracy" by engaging in "runaway rhetoric . . . outstripped of the supporting scientific data" (2000, p. 3; see also Lyne and Howe, 1990). In other words, when the scientific voice leaves the higher sphere of science proper and descends into the public "marketplace," it is able to wield substantial social influence without being held accountable by scientific or social standards. Third, the audience for these priestly claims exists external to their sphere of origination. While the public voice of science must mediate between the scientific and the popular spheres, its ultimate function is to "perpetuate the values of a closed system" by reinforcing the boundaries that deny nonscientific agents access to the specialized codes of scientific discourse (Lessl, 1989, p. 194).

The biosocial function of scientific argument is different because its model of relation to society is not vertical, but horizontal. Science becomes a part of the social fabric, "embedded," in Rabinow's terms, and it no longer stands outside of and above this plane of culture. The horizontal model does not entirely supplant the vertical: Rabinow acknowledges that in general, the societies of control and the types of power particular to them do not entirely replace disciplinary mechanisms. The latter remain, although they are often transformed in their interaction with new forms of power and interiorization. I would make a similar argument about scientific communication: Vertical functions are not entirely displaced, but the horizontal movements of scientific discourse represent an important general shift. It is this shift that I want to focus on, maintaining an awareness that these more "traditional" characteristics of scientific communication can still persist. The horizontal model differs from the vertical model and introduces different considerations into the analysis of public argument. Initially, while the vertical model indicates a "priestly" voice that is extensive and operates across the boundaries of two distinct spheres as an intercultural agency, the horizontal model implies a distributive mode of address in which this distinction is mitigated or even abolished. In more concrete terms, the "voice" of science is no longer the exclusive property of scientists, but becomes the purview of nonscientists, including politicians, educators, and parents. Everyday people with no particular claim to specialized knowledge are entitled to utilize this "voice" in their daily practices. To reference an earlier example, the individual who feels "down" might describe himself or herself as having a serotonin imbalance or a dysfunction of the amygdala despite their lack of medical training. Second, science functions not through priestly or hierarchical appeals, but as a distributive rhetoric. The horizontal or biosocial address does not preserve scientific privilege by maintaining the rhetorical and institutional boundaries separating science from society, but rather disperses scientific rhetoric. This dispersion is both rhetorical and institutional. Goodnight's famous discussion of the technical, personal and public spheres can no longer serve as the foundation for criticism of public argument. In other words, Mitchell's condemnation of the "runaway rhetoric" of science, or Lyne and Howe's fears about the movement of science into a public context, are not adequate to the biosocial context.

Thus, this embedding of scientific discourse throughout the social fabric is a rhetorical shift that is part and parcel of a shift in the structure of institutions. It is this shift that Deleuze (1995) attempts to describe by drawing distinctions between disciplinary societies and societies of control, and between modes and modulations. The institutional distance necessary in disciplinary societies requires vertical models of authority. A particular institution must guarantee its function as a distinct "space" of social control by maintaining a monopoly on a certain discourse and ensuring that it is the exclusive voice of authority for this "space." Take, for instance, Deleuze's example of education. In the vertical model, education is a distinct science and its guarantees its autonomy by having recognized experts who are authorized to speak and exercise control in a clearly demarcated social space, the school. In a horizontal model, the functions of education are dispersed and become the responsibility of parents, caretakers, physicians, and individuals. Everyone can—and is obligated to—adopt the language of the science of education. The rhetorical dispersion is a part of a distribution of institutional functions that blurs the boundaries constitutive of the spaces in which these functions are properly exercised.

In the biosocial context, science becomes the ubiquitous backdrop of general social practice, or an atmosphere that envelops the entirety of the cultural plane. Its truth-value is rarely questioned as it becomes a common grammar appropriate for nonspecialists and obligatory in multiple areas of public life. Science becomes, in effect, unmoored from strict institutional locations and it is authorized to speak on virtually all matters. One consequence of this spread is that science becomes responsible for the social effects which it is a part of, accountable for the social fabric in which it is embedded. In the next section, I examine Hillary Clinton and Laura Bush's addresses in order to specify the characteristics of biosocial address when science is taken up in public policy discourses. After identifying the common features of these two instances of public address, I conclude by returning to the questions of science, public argument, and biosocial arrangement by reflecting on the discursive characteristics of controversy.

Architectures of Governmentality: Biosocial Discourse and Social Policy

The Clinton and Bush addresses are so similar as to be interchangeable. The speeches exhibit shared discursive patterns, and they both prioritize themes emphasizing the *dissemination* and the *sociality* of scientific research. Babies' brains are constructed as nationally relevant resources, of concern for everyone from parents to business leaders to politicians. This emphasis on dissemination constructs the audience of the baby-brain research as all Americans, universalizing its scope in congruence with national identity. Further, by constructing children's minds as nationally significant, linkages connecting business practices, education, parenting and a host of other social functions are articulated. The entirety of the social field is connected by way of a ubiquitous scientific "atmosphere," or discursive backdrop that speaks on all matters. In this manner, scientific knowledge and understanding afforded by everyday experiences are melded into a universal, biosocial discourse.

At the 2001 Bush summit, neuroscientist Patricia Kuhl addressed the attendees, lauding the conference for calling attention "to the country's most precious resource, our children" (Kuhl, 2001). Kuhl describes brain imaging technologies that "are revealing, in a tangible way, how the brain really works," as important advances that aid in the preservation and improvement of these precious national resources. The challenge is for researchers, educators, parents and politicians to come together and ameliorate the "big gap between the neuron and the chalkboard," putting the knowledge produced by brain images in the service of bettering the minds of American children (Kuhl, 2001). Clinton and Bush develop this theme in their addresses, emphasizing the need to disseminate scientific knowledge to all members of American society. There are two important premises that this theme develops: first, science is a knowledge that must be distributed at every level of society and taken up by each member in daily practice. Science is not separate from society, but part of the very ways of going about everyday life. Second, *all* members of society are obligated to attend to this scientific knowledge. The babies' brains are not just of concern for parents and educators, but also business people, politicians, and ultimately every American. This discourse of national identity surrounds the babies' brain and suggests seamless linkages between all spheres of society, including parenting, education, economic development, and political regulation.

In her address, Clinton describes the mission of the conference as providing an opportunity for researchers to put their knowledge in the service of America's families. She continues:

> But this is not just for America's families. This information is crucial for anyone in the position of leaving an impression on a young child's growing mind—day-care workers, teachers, doctors and nurses, television writers and producers, business leaders, government policy-makers, all of us (1997).

Clinton links the universality of the significance of this research directly to brain research on the first three years of life. This research reveals, she states, that “everything we do with a child has some kind of potential physical influence on that rapidly-forming brain,” including the “seemingly trivial events” of day-to-day life (Clinton, 1997). Echoing the brain research on the first three years, Clinton states that these seemingly trivial experiences, interactions that can occur between a child and anyone they encounter and not just parents or teachers, “can determine whether children will grow up to be peaceful or violent citizens, focused or unfocused workers, attentive or detached parents” (1997). Thus, babies’ brains are important to everyone at the levels of both cause and effect: all citizens can shape, or wire, the child’s brain and all are ultimately affected by the social consequences associated with crime, productivity, and parenting. Clinton summarizes the goals of the conference to encourage the “nation” to “lay the groundwork for an American future with increased prosperity, better health, fewer social ills and ever greater opportunities for our citizens to lead fulfilling lives in a strong country in the next century” (1997).

The audience for the scientific findings is universalized: because science reveals how every interaction shapes a child, and this molding produces every type from the good citizen to the violent criminal, the fate of society hangs in balance. Every activity is imbued with scientific importance, because brain imaging reveals its biological significance at the level of the child’s brain. Every activity has a scientific, or biological, implication, and similarly, every aspect of society can be improved through the distribution and uptake of scientific knowledge. Clinton directly references historical examples of scientific advances in the field of medicine, including vaccines, to predict advances in brain science that will transform every level of society. She describes the history of scientific advances in improving food and water quality, developing vaccines, and generally aiding in the pursuit of physical health. The breakthroughs in brain science will aid in total health: “We are completing the job of primary prevention, and coming closer to the day when we should be able to ensure the well-being of children in every domain—physical, social, intellectual and emotional” (1997). So defined, health becomes a discursive rubric for the unification of literally all arenas of life. Not only are the areas associated with physical, social and intellectual concerns unified, they are brought together as properly scientific, namely biological, considerations.

In her address, Laura Bush similarly links together diverse social areas by way of brain biology. She begins her speech as devoted to “a subject that’s important to all of us, and to all Americans—our young children” (2001). Both Clinton and Bush universalize their audience by constructing brain science as a properly American issue: the mental life of children is a national issue, one that pertains specifically to American identity. Like Clinton, Bush references scientific conclusions associated with the first three years theories. She states, “One thing we know for sure: What a child experiences from day one to grade one has a direct and profound impact on his future, and on our future” (2001). The most critical years are those “between the crib and the classroom,” suggesting the need for educational interventions that occur before formal schooling begins (2001). The 2001 Bush conference was explicitly dedicated to education, an issue that has been at the top of President Bush’s domestic policy agenda. Thus, Laura Bush’s address is more specifically designed for the consideration of educational issues. She speaks to scientific experts, explaining that teachers “need to know what you know” about early childhood brain development and learning (2001). Teachers “need to have the latest information on the science of learning,” so that they can effectively employ “research-based practices” (2001). However, despite this attention to the role of educators, Bush universalizes her audience by constructing child development as a national issue. She states that the conference will provide information “that everyone should know . . . not only mothers and fathers and caregivers, but also educators, health care professionals, policy makers, foundations and businesses” (2001). Everyone has an interest in gaining scientific knowledge, because everyone has the shared goal: “healthy, happy, and well-educated young Americans” (2001).

Bush, like Clinton, constructs brain science as an issue with universal national appeal because anyone who interacts with a child can have a potentially formative impact on their brain and hence their future as a social citizen. It is “daily activities” that organize the developing brain (2001). The topic is national in scope, Bush insists, concluding her address, “We all have the duty to call attention to the science and seriousness of early childhood cognitive development . . . because the ages between birth and age five are the foundation upon which successful lives are built” (2001). Everyone should be “armed’ with the latest brain research so that they can play their part in developing healthy citizens by way of wiring healthy brains (Bush, 2001). In Bush’s address, teachers have a special role to play, hence the Bush administration’s emphasis on programs such as the No Child Left Behind Act. Ultimately, however, all Americans have an obligation to take up scientific findings in order to ensure a future free of the myriad social ills caused by bad citizens.

In this process of dissemination, science is not simply an authority that speaks on multiple aspects of daily life. Each individual must see his or her daily activities in a properly scientific light. Thomas Lessl describes this as a priestly function, because non-scientists are implored to view their activities as having a potential scientific meaning. In Lessl's usage, this scientization of the populace is ultimately a strategy of identification that preserves scientific authority while allowing scientists to gain the type of support and social resources they need to maintain their higher position. In the biosocial context, the function is similar but the purpose is different. It is not the preservation of scientific authority, but the dispersal and dissemination of scientific vocabularies. Clinton states, for example, that scientific brain research "has now confirmed what many parents have instinctively known all along, that the song a father sings to his child in the morning, or a story that a mother reads to her child before bed help lay the foundation for a child's life, and in turn, for our nation's future" (1997). Bush similarly states to her audience, "You were probably not surprised to learn that science now confirms some of the hunches that parents have had for generations" (2001). Clinton describes the "revolutionary idea" that "the activities that are the easiest, cheapest, and most fun to do with your child are also the best for his or her development," giving the example of reading to her own daughter and later discovering the ways in which she was "literally turning on the power in her brain, firing up the connections that would enable her to speak and read at as high a level as she possibly could reach" (1997). American citizens, and parents in particular, are invited to see each of their daily interactions with children as having a specific scientific effect at the level of brain biology. In this way, ordinary activities, "hunches" or “instincts,” become modes of disseminating biological vocabularies and scientific knowledge to infuse the entirety of social experience.

As Lessl describes, the priestly function encourages the “commonfolk,” or the nonscientists, to recognize the authority of the scientific voice that is derived from its access to the idiom of nature. It is not so much scientists that are special, but nature, and scientists have privileged access to this voice of nature that separates them from the nonscientist masses. In the biosocial context, however, the function of scientific discourse is slightly different. The language of science moves from a language of nature to a language of commonsense. Because everything is defined as natural, in the sense that biology is a part of sociality through and through, the voice of nature is not the exclusive purview of scientists. All citizens are invited to recognize their “hunches,” “instincts” and daily routines as informed by natural, biological knowledge.

This emphasis on the commonsense nature of biological and scientific knowledge is intertwined with the emphasis on babies’ brains as a national resource: the focus here is on American national identity and its relation to babies. Both Clinton and Bush also universalize the importance of scientific knowledge by explicitly constructing childhood issues as nonpartisan affairs. Although both conferences introduce a range of policy issues and specific proposals, many of them associated with hot-button and partisan issues such as welfare reform and the funding of public education, the Clinton and Bush addresses exhibit a marked emphasis on political neutrality. In her concluding remarks, Clinton states, “I hope we will be able to think of good arguments and effective ways of communicating why this is important and why it should go far beyond partisan politics and become an American issue, not an issue of any political party or ideology, as to how we try to enhance the raising of our children" (1997). Clinton's remarks resonate with her book, *It Takes a Village* (1996), which constructed the raising of children as a shared social responsibility and not the strict purview of parents. Children become national resources, and the responsibility for their cultivation lies with everyone. This is both a moral appeal and an argument Clinton bases in scientific brain research. Everyone who participates in society at any level has an impact on the wiring of a child's brain. Thus, each person is obligated, regardless of their particular social role or category, to arm themselves with the scientific knowledge necessary for ensuring responsible influence. The scientific research needs "dissemination and communication" to all Americans, and Clinton urges the conference attendees to "figure out ways of using that [scientific evidence] in our respective positions" (1997).

Laura Bush similarly highlights childcare as a nonpartisan issue. She concludes her address, "The topic of our children rises above partisan politics and turf battles, and by being here, you have raised it to the level of importance that it truly deserves" (2001). In these examples, the ethos of childhood is an important component in the construction of American identity and its relationship to biosociality. Children are often thought to be innocent, not yet contaminated by the ills and compromises of political activity. They are an important national resource, shaped by society, but not yet a part of society with all of the responsibilities that social membership implies. There is a murmur of the "blank slate" doctrine at play here, not only as a scientific conclusion but an ideology about the purity and unblemished nature of children. These connotations of childhood innocence and purity play an important role in framing the policy initiatives introduced "in the name of the children" as universally appealing from a moral or ethical standpoint. I will explore this function of childhood discourse in the next section, when I examine how controversies function in this nexus of science, society and politics.

"But Don't You Like Babies?": Rhetorical Dispute in Biosocial Times

The Clinton and Bush speeches from the White House conferences on child development illustrate how brain science permeates public policy discourses. Brain research is distributed throughout society, and everyone is obligated to take up this discourse and its associated knowledge and enact it through everyday activities. In the analysis of the First Ladies' speeches, I argue that brain science is constructed as something that must be disseminated, unmooring it from the external authority of objective nature, or the privileged access that experts have to this nature through the scientific method. Not only is brain science something that must be communicated to and distributed to all Americans, it is a thoroughly social discourse. The totality of society is articulated at the level of biology, and biology of the brain simultaneously becomes a knowledge that is relevant to everything social, cultural or personal. When science becomes something embedded throughout the social fabric, the rhetorical function of authority is transformed. The priestly function, as Lessl describes the public communication of scientific authority, is no longer adequate to this biosocial context. In the remainder of this chapter, I examine some of the challenges that have been posed to the scientific findings that underlie both Clinton's and Bush's premises, specifically the scientific knowledge associated with the "first three years" theories. Both Clinton and Bush, despite their leadership of two different and often competing political parties, represent the brain science of the first three years as an unquestioned fact that goes beyond partisan politics and represents an unquestioned positive social discourse. In short, the utilization of these scientific theories does not have determinate political consequences (e.g., consequences that would suggest a particular political ideology and make claims of nonpartisanship difficult to sustain). The utilization of scientific argument in public policy contexts is itself uncontroversial and, in a biosocial context, perhaps inevitable and expected.

The "scientization of politics" is valued negatively by Habermas, and other argument scholars have similarly expressed suspicion or condemnation of claims based on scientific authority used to persuade for (and against) public policy (e.g. Goodnight, 1991). This is because scientific discourse is usually viewed as a rhetoric of expertise that grounds its authority in a realm (nature) accessible only to a privileged few. Biosocial discourse is different, however, because while it is scientific, it is also accessible and ubiquitous. When science becomes the mode of speaking true for all dimensions of the social, it loses some of its special characteristics and becomes responsible for the conditions of sociality. More concretely, in the baby-brain discourses, scientific arguments can longer solely ground their claims in "nature"—they must take into account social consequences. When Bruer and others challenge the "first three years" policies on the grounds that the science is invalid (by scientific standards), the response is that the policies are socially beneficial. Bruer becomes, at least implicitly, cast as someone who is "against" babies, or family-friendly initiatives. The scientific veracity of the baby-brain discourses becomes secondary, or even unimportant, in light of the perceived social benefits of the policies supported by this science. Science does not become less authoritative, or privileged as truthful discourse; however, the function and responsibility of its authority changes. Science becomes discursively accountable for the social effects of its recommendations. Just as the case study on brain-based self-help showed how in biosocial discourse, normative biology is articulated through its social expression, in policy-oriented discourse scientific veracity itself is articulated in terms of its social effects.

Zigler, Finn-Stevenson and Hall describe the "considerable controversy" over "how best to lay the foundation of a human being's life, how to optimize the chance that an individual will grow and develop into a whole, healthy person capable of living a loving, productive life" (2002, p. 7). The controversy exists between the "zero-to-three-ers" and the "splinter group" challenging the zero-to-three theory as "myth." The authors write:

> Legislation promoting early intervention and developmentally appropriate early childhood education (Head Start, for example), adequate nutrition during the prenatal and early childhood period (WIC, the Women, Infants, and Children program), health care for children (for example, CHIP, the Children's Health Insurance Program, which expands health care coverage to low-income children ineligible for Medicaid), family cohesiveness and continuity of care in the first months of life (family and medical leave legislation), and other family-friendly programs have been shown not only to benefit individual children but also to be cost effective means of enhancing social competence in large groups of children while minimizing the need for future remedial services (2002, p. 8).

The problem, according to the authors, is that controversy over the brain research that supports these policies could cause legislators to "withdraw or weaken their backing for these important child and family policies" (2002, p. 17). Even if the findings of the brain research are overstated or exaggerated in media reports that disseminate this science to the public and policy-makers, this coverage, despite its inaccuracies, has led to "programs and interventions that have actually provided valuable services to children at risk for educational and social failure" (2002, p. 186). These programs might be based on "simplistic understandings," but the programs are nonetheless "sound and promising" (209).

The website for the nonprofit group Zero to Three has a specific reply to Bruer, the author of *The Myth of the First Three Years* and the lead voice for the "opposition" to the "zero-to-three-ers." The reply states that Bruer's leap from the fact that the brain research is in its "infancy" to the "absurd conclusion that what happens to a child in the early years is of little consequence to subsequent intellectual development" is unfortunate (1999). The group expresses concern that "policy makers will see Bruer's argument as an excuse to ignore the growing interest and demand for policies and services that support babies, toddlers and their families" (1999).

This discourse has several noteworthy features. First, what is *not* challenged by either side in the controversy is that neuroscience is *the* correct, or truthful, discourse for determining public policy. When the zero-to-three theory, offered as the result of empirical, hard science, is challenged, it is challenged on the grounds that it is unscientific, or not scientific enough. When the zero-to-three advocates respond to this challenge, they do not abandon the assumption that policy decisions should be based on the bedrock of hard science. They admit of potential "exaggerations," or "simplistic understandings," but on the whole, the privilege of science is never challenged. The zero-to-three advocates do not abandon the scientific foundations of their position, however, this scientific foundation is expanded to include social effects. This is the second feature:

the rhetorical dimensions of public scientific discourse are transformed. Bruer and likeminded challengers are cast as opponents of policies that help babies, toddlers and families. This points to a second assumption that is challenged by neither the zero-to-three-ers nor Bruer. This is the premise that the regulation of infants and families is a social good properly conducted through interventions at the local, state and federal level. Even if there are disagreements about precisely which policies are the most beneficial, the underlying premise consistent with a logic of governmentality appears to be taken for granted.

In most studies of scientific argument in policy contexts, it is assumed that controversy emerges when the veracity of a particular scientific claim is challenged. In these moments, the precise boundaries of science are thrown into question and the properly political (and rhetorical) nature of demarcation practices is recognized. In these moments of controversy, what counts as science is negotiated and renegotiated. When science is not challenged, but instead taken for granted as a presumed authority, its function is dangerous and often threatens deliberative decision making because it usurps public debate and curtails democratic discussion with appeals to objectivity and the universal truths of nature. In both of these instances, the scenarios of challenge and acceptance, it is assumed that there is a vantage point external to science from which one can query the proper scope of science or, in the latter case, be divested of proper authority by the intrusion of science outside of its proper sphere. The normative assumption is that there is some discursive ground, and hence some social territory, that is not properly scientific. In both cases, the controversies are ultimately questions of territoriality: does science stay in its proper sphere? What is the proper sphere of science? Rhetoricians are wary of the expansion of science because it is assumed that when science expands, some other authority must retreat or lose ground. There is, to simplify matters a great deal, often the presumption of a zero-sum relationship between science and society. One step forward for science, one step backward for democracy. The biosocial rhetoric of science, however, suggests that science and society are not in a competitive relationship but are intertwined and in some cases fused.

Conclusion

Science has been described as a “cult of jargon” that clearly demarcates insiders (scientists) from outsiders (the populace) (Montgomery, 1996, p. 7). The natural world is named by science and hence inaccessible to the common folk. The rhetoric of science, in this perspective, relies on claims that it has special access to truths independent of social and political concerns. In the biosocial context, however, the differentiations between nature and society break down and scientific rhetoric can no longer rely on objective nature to ground its truth claims. Scientific discourse becomes accessible to everyone, and at the same time it becomes accountable for social effects. Nature is not an incontestable sphere that resides above or outside of society, rather, nature and society are simply two different modes of public organization. In other words, they are articulated rather than given (see Latour, 1998, 2004; Stormer, 2004).

This biosocial rhetoric of science is evident in the brain-based self-help books that impel their readers to understand their experiences through scientific, biological vocabularies, and in popular media discourses that articulate social tasks such as parenting and education in biological terminologies. In policy arenas, science is deployed in public argument in such a way that it is no longer immune to criticisms based on social and political factors. In a simultaneous double movement, the public grammar is infused with scientific terminologies, but science itself becomes a social discourse. In the final chapter, I conclude by considering the political and ethical implications of this rhetorical transformation.

CHAPTER SIX
THE BRAIN IS THE FRONTIER

Throughout this project, I have argued that contemporary articulations of the brain trouble the oppositions between culture and nature, mind and matter, subject and object. Using the concept of the biosocial as a description for the present arrangement of nature (biology) and society (culture), I have suggested that modern neuroscience embodies a paradox, simultaneously embracing extreme versions of biological determinism (or a materialist monism) and zealous visions of unfettered agency (both individual and collective). I say that this paradox is apparent because, examined rhetorically, it is not a paradox at all but a productive nexus for the distribution of identities and differences. This dynamic arrangement has been described as the superfold, in reference to the intricate and dynamic subjectivities it manufactures, and modulation, in reference to the institutional dispersions that accompany these subjectivities.

In this concluding chapter, I have two major purposes: First, the problematic of biosocial identities and institutions calls for a reflexive examination of rhetoric itself and its relationship to science. Second, the description of a new form of society/identity by way of the biosocial demands an attention to ethics: If the world we inhabit has been "rearranged," what are the possibilities for ethical response, or ethical engagement, within this rubric? I adopt the vocabulary of "ethics" instead of "morality" to distance this project from moral judgments about the rightness or wrongness of biotechnological alteration. Ethics suggests to me a series of practices, or habits, that accompany negotiated knowledge. In other words, I do not wish to denounce or celebrate the changes I document throughout this project, however, I want to negotiate the possibilities that these changes provide and suggest that there are productive and beneficial ways of addressing these changes.

I want to address these queries by troubling a common trope used in neuroscience discourses: the metaphor of the brain as a *frontier*. The frontier trope is a geographical metaphor that can be read as a mobile line that articulates culture and nature, subject and object, human and nonhuman, and ultimately rhetoric and science, as contingent variables in a differential geography. This geographical orientation demands a corresponding ethics that is mobile and open-ended, rather than static and determined.

Topographies of the Surface

In neuroscience discourses, the brain is often figured as a frontier. Sharon Begley, for example, quotes James Watson: “The brain is the last and greatest biological frontier, the most complex thing we have yet discovered in our universe” (1992, p. 66). This trope circulates in both popular and scientific contexts, suggesting that the brain is the final frontier and the scientists who visualize it with new technologies are pioneering mapmakers destined to master this untamed territory. These scientists are, Rita Carter describes, “brain explorers,” who will soon know “all there is to know about human nature and experience” (1998, p. 8). In his address at the baby-brain summit, even former President Bill Clinton engages this trope. Brain imaging research, he states, “has opened a new frontier. Great exploration is, of course, not new to this country. We have gone across the land, we have gone across the globe, we have gone into the skies, and now we are going deep into ourselves and into our children” (1997). Our interiors, the space of subjective existence, are made tangible and offered up to scientific scrutiny and manipulation through brain imaging technologies.

Clinton’s comments suggest a major theme of the neuroscience discourses, and biosociality in general. Both individuals and institutions are divested of spaces of interiority and are opened up onto the social field, or onto planes of exteriority. Biomedicine and its technologies for rendering the human body in visible, digital form assert the body as an archive, Waldby writes, with projects “to itinerise and index the human body as a finite content, open to multiple forms of ordering and modes of retrieval” (2000b, p. 39). The categories of manipulation and transformation that accompany this mediation of the human body are posthuman: their function is to throw the definition of human, the distinction between human and non-human, into radical instability. In “The Posthuman Manifesto,” Pepperrell (2003) succinctly states, “Human bodies have no boundaries” (p. 178). The Cartesian space of interiority that guarantees truth and identity is opened up as a frontier, a topography for exploration, visualization and colonization. The boundaries of “the self” are thrown into question by the knowledge that events on the “outside” have an immediate relation to events on the “inside,” each side exchanging the role of cause and effect in continuous fashion.

This exhaustion of interiority is not confined to human psychology. It is a more general shift in patterns of individuation. This shift can be seen in scientific practices as well as the social sphere, and it has particular import for conceptions of individual identity. Manuel DeLanda writes, for instance, of a paradigm shift in the sciences in the past 30 years, in which the devotion to “conservative systems” is giving way “to the realization that most systems in nature are subject to flows of matter and energy that continuously move through them" (1992, p. 129). Systems are "conservative" if they are artificially isolated. At the social level, Deleuze's concept of modulation is intended to address this process as it occurs in institutions. Institutions are not "conservative systems," but flows of bodies and functions. Just as individual subjects are "opened up" and revealed as artificially isolated flows of social and biological relationships, institutions are divested of interior spaces that close them off as discrete organizations. Thus, in the example of care for babies' brains, the seamless movement from family to school to government program shows the continuity of functions that destabilizes institutional boundaries. Hardt and Negri (2004) point to a general shift in modes of individuation when they document the historic analogy between the social body and the physical body. The Cartesian model corresponds to theories of sovereignty. If the analogy still holds today, "it is because the human body itself is a multitude organized on the plane of immanence" (p. 337). There are corresponding changes in the form of the individual and the form of society.

As a mode of individuation, the notion of "frontier" is interesting, because while it suggests a geography of the surface, it also connotes a clear demarcation between civilization and a space of pure, untamed nature. The frontier trope is common in scientific discourses, and it is usually taken to suggest scientific domination or conquest. In this sense, scientific mapping of the brain represents the closure of knowledge, the ultimate revelation of the ultimate truth. In this concluding chapter, I want to suggest a different reading of "frontier" as a mode of *articulation*. A frontier functions as a mobile line of division, a dynamic membrane whose movement constantly results in new spatial configurations and new contingent individuations. In order to flesh out this reading of the frontier trope and its accompanying geographic verbiage, I turn to Frederick Jackson Turner, one of the most important historians of the American frontier. Jackson's discussion of the frontier (1920) provides a useful heuristic for thinking the function of the frontier in contemporary brain discourses.[13]

Jackson is attentive to the uniquely American construction of the "frontier." In Europe, the concept of frontier designates a determinate and stable political boundary. In America, however, with its vast geography and particular legacy of Westward expansion, the frontier signifies the edge of a settlement, a mobile line that constantly reconfigures the elements on either side. Jackson writes:

> Thus American development has exhibited not merely advance along a single line, but a return to primitive conditions on a continually advancing frontier line, and a new development for that area. American social development has been continually beginning over again on the frontier. This perennial rebirth, this fluidity of American life, this expansion westward with its new opportunities, its continuous touch with the simplicity of primitive society, furnish the forces dominating the American character (p. 2-3).

Jackson's description is romantic, to be sure, but it gets at several important functions of the frontier that are often neglected in contemporary critiques of colonial discourse. First, the frontier is mobile—a line that is continually advancing. Additionally, the movement is not simply the assimilation of more territory to the colonizer's, or pioneer's, way of life. The conditions of the latter are fundamentally transformed by the former—the way of life, or the identity, of the pioneer is constantly being reinvented and reconfigured. The pioneer's "subjectivity" is fluid, and it is transformed as much as the geography of the territory is transformed by the continuous movement of the frontier.

Here, the frontier functions less as a boundary signifying the exercise of power than as a membrane that brings inner and outer, subject and object, into contact at the same time that it defines their contingent identities. Turner describes the frontier as "the outer edge of a wave—the meeting point between savagery and civilization" (p. 3). The frontier is an edge that not only separates, but brings together. Additionally, it is impossible to conceive of the movement of the frontier, or the movement of colonization and territorial expansion, as a unilateral exercise of power or a relation of mastery. At the frontier, the pioneer "must accept the conditions which it furnishes, or perish" (p. 4). At the frontier, power is not unilateral but reciprocally conditioned by the line itself. Instead of the causal relation whereby the pioneer acts upon, and transforms, the territory, the frontier itself simultaneously transforms territory and pioneer through articulation, or mutual constitution.

Later, Turner describes the frontier as a "moment," an instant where "the bonds of custom are broken and unrestraint is triumphant" (p. 38). There is no *tabula rasa*, or passive territory awaiting "man's" imprint, rather, "The stubborn American environment is there with its imperious summons to accepts its conditions; the inherited ways of doing things are also there; and yet, in spite of the environment, and in spite of custom, each frontier did indeed furnish a new field of opportunity, a gate of escape from the bondage of the past" (p. 38). In this passage, the frontier is the active voice, compelling the pioneer to mold himself or herself, or adapt himself or herself, to its demands. The pioneer is momentarily in-between tradition, custom, and civilization and nature, constituted by both yet furnished with a strange agency by virtue of being “in between” the demands of culture and nature. The frontier is a moment of undecidability in between nature and culture, and it features a strange or paradoxical reciprocity. At the moment of the frontier, the pioneer is uncivilized, or thrown back to a primitive state, at the same time that he or she moves forward to impose a new order (culture) on the frontier. In this moment between future and past, in between colonization and past determination, “man’s” own indetermination is thrown into relief. The frontier is an edge that “calls out militant qualities and reveals the imprint of wilderness conditions upon the psychology and morals as well as the institutions of the people” (p. 65): in other words, at the moment of the frontier person’s own affinity with nature, the territory, the uncivilized or “savage” is called forth.

The frontier mythology is part of the tradition of American individualism, the narrative of solitary man battling the forces of nature to acquire freedom and mastery. However, the frontier also functions socially and can be thought of as an agent of dispersion. The frontier, Turner notes, was treated in census reports as the margin of that settlement with a density of two or more per square mile. Turner develops this, describing the frontier as an elastic line partially defined by networks such as communication systems, railroads, populations, and natural markers such as rivers or mountain ranges. Depending on one’s orientation, the frontier might differ—he speaks of a farmer’s frontier, trader’s frontier, merchant’s frontier. The frontier itself is defined in terms of both nature and culture. Turner writes:

> Thus civilization in America has followed the arteries made by geology, pouring an ever rich tide through them, until at last the slender paths of aboriginal

> intercourse have been broadened and interwoven into the complex mazes of modern commercial lines; the wilderness has been interpenetrated by lines of civilization growing ever more numerous. It is like the steady growth of a complex nervous system for the originally simple, inert continent (p. 14-5).

The frontier is at once the natural river that pre-exists its discovery by man, and the river that functions to transport goods for the purposes of development. As the lines of nature and the lines of civilization become intertwined and interpenetrated, the difference between them is undecidable. The river is just as natural and just as socially constructed as the shipping route.

When Turner states that the frontier brings civilization into contact with savagery, throwing the pioneer back to a former, primitive state and calling forth the continual renewal of social systems, he alludes to the indeterminacy of both nature and culture. The pioneer ideal is one of conquest, to be sure: Turner describes a universal quest after the unknown, a yearning to go “beyond the sky line, where strange roads go down” (p. 269). Yet, as the pioneer advances into this unknown, he is forced to make old tools fit new purposes, to shape former habits, institutions and ideas to changed conditions, and to build a new society in addition to breaking new soil. The frontier mentality embodies a rebellious, anti-conventional spirit, but it is not a pure creative power of actively shaping a passive nature. The frontier signifies a grappling, a struggle, a mutual transformation of nature and culture through the movement of the line that constitutes the boundaries of both. The frontier is an individuating edge that defines the contours of the territory and the pioneer, but is itself undecidable.

When the brain is conceived as frontier, it is not simply an untamed biological organ awaiting scientific discovery. Scientific endeavors to "map" the brain are constitutive operations that simultaneously transform the "subject" and "object" of knowledge. Deleuze (1990) describes "the entire biopsychic life" as "a question of dimensions, projections, axes, rotations, and foldings" (p. 222). The brain "is not only a corporeal organ but also the inductor of another invisible, incorporeal, and metaphysical surface on which all events are inscribed and symbolized" (p. 223). This is clearly seen in neuroscience discourses: the brain is both the biological organ that exhibits arrays of electrical and chemical activity, but it is also the surface on which all aspects of subjective existence are inscribed. Visualizing the electrical and chemical activity of the brain is also seeing emotions, motives, and the roots of every whim and behavior. The ability to "see" the brain is akin to "seeing" the mind. This "bio-metaphysical" brain becomes the discursive site for the articulation of numerous individual and collective social practices. The brain is the object of knowledge, but it is also what drives the quest for knowledge: it is the ultimate "knower." This strange configuration of the brain as an entity with a dual existence, biological and metaphysical, leads to odd statements such as E.O. Wilson's: "The human brain is the most complex object known in the universe—known, that is, to itself" (1998, p. 106).

Encounter: Rhetoric and Neuroscience

If the dual configuration of the brain as both subject and object of its own activity is part and parcel of a more general shift in contemporary patterns of individuation, then rhetoric is not immune from these changes. This view of the world as flows of matter and energy that produce “identities” only in contingent fashion, through “artificial” processes, has significant consequences for the practice of rhetoric. Celeste Condit explains:

> Instead of discrete objects, the universe—both human and natural—is constituted of matter/energy in constant motion, taking on shifting forms through shifting relationships. Meaning arises out of the matter/form configurations as they take on and move through specific relationships and relationship patterns that are specified by language; that is, they are abstracted and categorized as members of a set with similarities significant enough to name—to treat as sharing essence. . . . Language carves out a specific set of relationships and simultaneously generates these relationships by naming them (1999b, p. 332).

In other words, there are no (linguistic or material) essences that pre-exist rhetorical action: rhetoric is a mode of articulation that temporarily fixes meaning, or “essence.” For Condit, this perspective demands a recognition of the materiality of rhetoric, a dimension that is often obscured in favor of “linguistic determinism” or “constructivist” doctrines that efface the role of physical matter in rhetorical action.

In many respects, rhetoric and neuroscience face each other across a vast frontier conceived as a gap. Rhetoricians tend to privilege language and subjective agency while neuroscientists prioritize nature and biological determinism. Or, as Condit describes the relationship between rhetoric and science, “When scientists have yelled ‘Nature!’ we humanists have always yelled ‘Nurture!’ in return” (1999b, p. 351). The frontier that divides rhetoric from neuroscience is not a gap, however, but a mode of articulation. It is, as Elizabeth Wilson writes, “the placement of a border, the declaration of a difference, that has the constitutive force in the securing of an identity” (1998, p. 75). Gestures of demarcation do not operate only in the service of scientific integrity, they are also foundational for our own disciplinary identities. In other words, our critical habits, including our treatments of scientific discourses, cultivate our rhetorical "habitat."

I conceive this project as a rhetorical encounter with neuroscience. In the sense of a Deleuzean encounter, the relationship between rhetoric and neuroscience is one of "double capture." Encounters are roughly equivalent to becomings, and it is essential to recognize that in an encounter, one of the participants does not become the other. An encounter is not an assimilation. Rather an encounter is an asymmetrical or an "a-parallel" evolution that happens between the two participants. Deleuze writes, "Finding, encountering, stealing instead of regulating, recognizing and judging" (2002, p. 8). Conventional notions of "rhetorical criticism" are too much the latter—operations of recognition and judgment, whereby rhetoric stands as the master discipline, quick to reveal, organize and praise or condemn the "text" that stands before it in judgment. The concept of a rhetorical encounter, however, recognizes that rhetoric is constituted by and through its critical practices as much as the objects of analysis. An encounter is a geographical mode of transformation, a mutual becoming-other that involves experimentation rather than judgment. William Connolly (2002) draws a distinction between practices of knowledge and practices of encounter. He writes that we have a limited, but real, capacity to encounter, but not to know "some dimensions of the world that escape, exceed, resist and destabilize" our best attempts to pin them down (p. 53). In this sense, rhetorical encounter is not an attempt to stand outside of neuroscience and determine its meaning or judge its content. Instead, there is a recognition that rhetoric is as much in question, as open to becoming, as neuroscience.

In more concrete terms, a rhetorical encounter with neuroscience means attending to the changes associated with biosociality and considering their implications for communication. Jennifer Daryl Slack writes that biotechnology is “disrupting, rearranging, and reconstituting the everyday as well as the knowledge necessary to study, understand, and intervene in this world of our creation” (2005, p. 5). Communication scholars, Slack argues, are poorly situated for the transformations wrought by the biotechnological revolution for three reasons: communication scholars tend to focus on “subdisciplinary” distinctions and avoid interactions with other, namely scientific, disciplines; they exhibit a loyalty to “transmission models” of communication that stymie productive engagements in a changing society; and there is a general failure to problematize the physical body. Bodies are not “things” but hybrids of words and objects, social and biological elements, matter and energy. Communication scholars “ought to be able to account for the flows within which possibility is empowered or disempowered with differential effects” (Slack, 2005, p. 9). By attending to neuroscience as a field of potential encounter that can transform our own understanding of communication, the body, and social change, we can better meet the challenges that Slack outlines here.

At a practical level, an encounter with neuroscience might mean paying more attention to biology in our development of rhetorical theory and criticism. As Condit (1999b) suggests, human communication is an essentially biological activity and to ignore its fundamental material dimensions impoverishes our academic practices. Connolly (2002) makes a similar argument. He writes, “Every theory of culture bears an implicit relation to biology and biological theory” (p. 3). Attempts to ignore biology are just as dangerous as reductionist theories that efface the agency of culture. It is too easy to “retreat toward a disembodied conception of cultural life or crawl into the black hole of sociobiology" (Connolly, 2002, p. 3). An attention to biology by no means necessitates a reductionist or determinist position. In fact, many of the insights from neuroscience are strikingly consistent with postmodernist or poststructuralist positions. Both science and rhetoric, for instance, have posed strong challenges to the Cartesian model of the subject, emphasizing the plasticity and fluidity of human identity. Both science and rhetoric similarly challenge the transmission models of communication that Slack criticizes. Biologists continue to employ theories of communication to describe material processes (e.g. Niehoff, 2005), and rhetorical scholars have turned to biology for metaphors to describe communication as "viral," an alternative to transmission models (e.g. Doyle, 1997). In short, neuroscience is not simply a passive "text" awaiting rhetorical explication: it is a reservoir of potential insights, theoretical contributions, and practical methodologies. Following the model of encounter, then, this project is an attempt to engage neuroscience in a productive manner. One consequence is that I have tried to approach neuroscience as a multifaceted and complex dynamic, irreducible to ideological judgments. Throughout this project, for instance, I neither condemn nor celebrate the advent of the biosocial. The biosocial is intended as a descriptive term to describe the contemporary arrangement of biology and culture, and it is neither an accolade nor a rebuke. In the final section of this chapter, I want to explicitly consider the question of ethics, or what it means to engage in ethical practices, in a biosocial era.

Frontier Morality

The changes associated with biosociality that I document throughout this project are linked to transformations in the meaning of morality. Francis Fukuyama writes that for

Americans today, the health of their bodies “has become a far greater obsession than the moral questions that tormented their forbears” (1992, p. 306). It is this replacement of moral discourse with the discourse of health and illness that Conrad and Schneider document (1992). Gregory Flaxman links this shift to neuroscience, writing: “These days, the old imperative to ‘be good’ has been supplemented by a psychopharmaceutical imperative” (2000, p. 54). With the growth of pharmaceuticals that can control mood and temperament, transforming one’s personality, there is a “duty to be well” (Greco, 1993), a new emphasis on controlling behavior and personality in very particular ways. As Flaxman notes, however, this new focus on the “morality” of biology and health is not simply about the imposition of control, or relations of domination. There is an exhortation to behave and to become an adaptable and efficient citizen, but the possibilities of “*experimenting* with perception, with the Man-Form qua God-Form, loom in a future yet to be thought, as the future to be thought” (Flaxman, 2000, p. 54). Deleuze (2002) offers the possibility of experimentation as an ethical practice distinct from moralizing judgment. Judgment is an activity that positions the critic outside of the object of analysis, while experimentation is an immanent practice. Politics, Deleuze writes, “is active experimentation, since we do not know in advance which way a line is going to turn” (p. 137). In this sense, experimentation, the tracing of lines across the social field, is a frontier morality. In Turner’s discussion of the Old West, frontier morality is a contingent affair that emerges from the interactions between the needs of the pioneer and the demands of the land. The notion of encounter follows from this understanding of ethics: an interaction that will transform both parties, but the outcome of which cannot be predicted in advance.

Within the biosocial field, a host of possibilities for experimentation are opened up. Instead of condemning or celebrating biotechnological advances, the question is what possible effects are these advances capable of, what combinations and interactions can propel their usage in interesting ways. Within rhetoric, there is a tendency to be wary of biological vocabularies because they tend to shift the focus of attention from social change to individual pathology. In other words, if social problems are thought to be products of individual biology, the solutions will be individual in nature and there will be no pressure to transform society. As this project argues, however, defining something as biological no longer means it is inevitable or even individual. With the fusion of biology and society that defines the biosocial, problems that are defined as biological are simultaneously defined as social problems. With biotechnology, biology is no longer conceived as inevitable but is itself open to social transformation. Biological vocabularies do not close off possibilities for social change: they create new avenues for social change. This does not mean that biology and biotechnology should be unequivocally celebrated. It does mean that outright condemnation or hostility toward these terminologies and technologies is unwarranted.

In some ways, I have described changes in biological vocabularies and technologies as an altogether new phenomenon, transforming the very fabric of human existence. On the other hand, however, these changes can be seen as very old news. As the term "posthuman" has been elaborated to describe not an historically specific event but a broader concept, the precise boundaries of human and non-human have always been thrown into question by various technological developments and modes of interacting with our cultural and "natural" environments. Whatever suspicions or hopes we might hold about biotechnology, brain imaging, and science in general, I am convinced that we cannot go back. In other words, comparing these changes to a previous time (real or imagined) and denouncing the changes as corruption of some prior purity or deviance from some former authenticity is a mode of "moral judgment" that is simply unproductive, particularly from a rhetorical perspective.

The ethical mode of response is not "Go back! Go back!," but "Here we are. Now what can we do? What possibilities exist?" This attitude, or mode of engaging or world, is what Michael McGee was getting at when he suggested that the critic's task is not the interpretation of pre-existing texts but the creation of texts from the fragments provided by our culture (1998, p. 83). Bemoaning the *loss* of some wholeness, whether it is the wholeness of a text (and the surety of meaning to be accessed through interpretation) or the wholeness of the person now fragmented by biological and social changes, is a stance of resignation and reaction. The alternative is to accept the conditions of fragmentation and work from there. If "wholeness" exists, it will not be found by judging the present according to the real or imagined past, it will be built through active engagement with the pieces we are given.

Notes

[1]This is the title of one of the most popular and widely referenced "brain books." See Antonio Damasio, 1994.

[2] This is by no means unchallenged, although scientific consensus generally supports this claim. For dissenting views see Guy C.Van Orden and Kenneth Paap (1997), and especially William Uttal (2001).

[3] It is difficult to overstate the extent to which these discourses construct the brain as the source of *everything*. The following statement is typical: "Of all the scientific enterprises that we taxpayers support, none is more important—from both a practical and a purely intellectual viewpoint—than neuroscience, the study of the brain. It is the brain that gives rise to perception, memory, emotion, language and all the other mysterious phenomena that constitute our minds—and have perplexed us for generations. The brain is also, in a sense, the source of our most pressing social problems: war, racism, poverty, pollution, crime" (Horgan, 1999). This excerpt is from a popular publication, the *Washington Post*. Neuroscientist V.S. Ramachandran makes a similar claim, listing a variety of "deep" questions, ranging from the nature of language, laughter, dreams and depression to sexuality and the existence of God, writing, "Surprisingly, we can now begin to provide scientific answers to at least some of these questions. Indeed, by studying these patients, we can even address lofty 'philosophical' questions about the nature of the self" (1998, p. 3).

[4] On July 25, 1989, then-president George Bush signed a presidential proclamation declaring 1990-2000 the Decade of the Brain. Lewis Judd writes, "The proclamation, which became Public Law 101-58, called for a vastly expanded national scientific effort to unlock the secrets of our most uniquely mysterious organ system, the brain" (2000). A 1993 study reported in *American Demographics* reported that "decade of the brain" was the most popular label for the decade, beating out contenders such as "gay nineties" and "Decade of the brand" by a landfall ("The Brainy 1990s," 1993).

[5]Brain images have been used, for instance, in an attempt to determine what makes Republicans' brains different from Democrats', to gage interest in the different makes of automobiles, to determine the cause of preferences for Coke or Pepsi, and to assess reactions to movie trailers. This movement of brain imaging from medical usage to more mundane concerns has spawned the label "neuromarketing." See, for instance, Elias (2004). Brain scans have also been used in studies that attempt to determine the neural basis of pedophilia, racist beliefs, and drug cravings. See O'Brien (2004) and Ambler, Braueutigam, Stins, Rose and Swithenby (2004).

[6]A classic discussion of faculty psychology, a basis for cognitive neuroscience, is Fodor (1983). See also Restak (1994). For a fascinating argument against the supposition that cognitive processes are accessible to empirical methods, see Thomas Nagel's oft-cited essay, "What Is It Like to be a Bat?" (1974/1981). For a more thorough discussion of cognitive science and its relation to information-processing models, see John Searle (1984). Searle is generally a critic of cognitive science, but he offers a nice summary of its major tenets and the assumptions that underlie its theories. Cognitive science is deeply embedded in computer models and artificial intelligence (AI). See the foundational essay by A.M. Turing (1950).

[7] For a "recuperative" reading of phrenology, see especially Fodor (1983). Dumit (2004) also claims that today's imaging researchers often "celebrate" phrenology as a precursor to their own brain mapping efforts (p. 23). Posner and Raichle (1994) also a offer a somewhat positive rendering of phrenology, describing its methods as "crude" but generally applauding its theoretical insight.

[8] For an excellent historical and physiological explanation of these technologies, see Raichle (1998). Raichle is recognized as a pioneer in modern brain imaging, and his account, although scientifically informed, is succinct and accessible. Uttal (2001) devotes a chapter of his book to discussing the history and function of imaging technologies. Dumit's account is highly readable, although he focuses on PET imaging. Another recommended resource for a more detailed description of these technologies is the textbook, *Brain Mapping: The Methods* (2nd edition, 2002), published by Elsevier Science. For a comparison of the advantages and disadvantages of each technology, see Zani, Biella, and Proverbio (2002).

[9] This seems to be an unusual caveat: in a book devoted to biological vocabularies, there is a hearty nod to morality. Amen suggests that "moral" (committed, monogamous, "normal") sex is good for the brain, but other sexual practices might be symptoms of brain pathology. This is interesting because it is such a good illustration of biosociality: the social and the biological are blended, and the result is curious hybrids such as this one where socially-sanctioned behaviors produce healthy brains, and socially-shunned behaviors are the product of unhealthy brains.

[10]This philosophy of human nature, that views the "natural" and healthy state in terms of citizenship and social behaviors, can also be seen in contemporary definitions of mental illness. Most mental disorders are defined according "impairment of function" symptoms, such as dysfunction in the workplace, in relationships, or other social contexts. The American Psychiatric Association's *Diagnostic and Statistical Manual* specifically states that a mental disorder is not, by definition, "an expectable and culturally sanctioned response to a particular event," but must be something that is *socially* abnormal (2000, p. xxxi). Many direct-to-consumer advertisements for psychiatric medications, particularly those for anxiety and depression, feature an individual having difficulties in social interaction: yelling at their children, performing poorly at work, or having conflicts with a partner.

[11] Nancy Andreasen (2001) is heavily invested in fighting the "stigma" associated with attitudes toward mental illness that do not recognize its biological origins. In *Brave New Brain*, she describes her previous book on brain science as revolutionary not only because of its scientific content but because of its important "social message."

[12] Foucault, and many of the theorists who take up his discussion, talks about the end of "man." He is talking about a specific form of human subjectivity, and he is in part drawing on Nietzsche's discussions of the end of God and the end of man. When I am engaging this discussion, I will use the masculine pronouns in quotation marks to signal that I am not talking about a particular gender. Aside from matters of conversational consistency, the gendered pronoun is appropriate here because it refers to a particular form of subjectivity, an historically specific form that has been conditioned by gender norms amongst other factors.

[13]Turner's "frontier thesis" has been the object of much academic and critical scrutiny, and I am certainly not the first to find his essay a provocative springboard for theoretical speculations.

REFERENCES

Amen, D. G. (1998). *Change your brain, change your life: the breakthrough program for conquering anxiety, depression, obsessiveness, anger, and impulsiveness* (1st ed.). New York: Times Books.

Amen, D. G. (2005). *Making a good brain great : the Amen Clinic program for achieving and sustaining optimal mental performance* (1st ed.). New York: Harmony Books.

American Psychiatric Association (2005). Healthy minds, healthy lives: Fact Sheet: Consumer survey on mental health issues. Retrieved March 13, 2006 from http://www.healthyminds.org/consumersurvey.cfm.

Andreasen, N. (2001). Brave new brain: Conquering mental illness in the age of the genome. Oxford: Oxford University Press.

Angus, I. (1992). The politics of common sense: Articulation theory and critical communication studies. In S. Deetz (Ed.), *Communication Yearbook/15* (pp. 535-570). Newbury Park, CA: SAGE Publications, Inc.

Anker, R. (1999). *Self-help and popular religion in modern American culture*. Westport, CT: Greenwood Press.

Barry, A., T. Osborne, and N. Rose (Eds.), *Foucault and political reason*. London: UCL Press.

Beaulieu, A. (2000). The brain at the end of the rainbow: The promises of brain scans in the research field and the media. In J. Marchesseault and K. Sawchuck (Eds.), *Wild science: Reading feminism, medicine and the media* (pp. 39-54). New York: Routledge.

Beaulieu, A. (2001). Voxels in the brain: Neuroscience, informatics and changing notions of objectivity. *Social Studies of Science, 31(5)*, 1-45.

Beaulieu, A. (2002). Images are not the (only) truth: Brain mapping, visual knowledge, and iconoclasm. *Science, Technology & Human Values 27(1)*, 53-86.

Begley, S. (1992, April 4). The brain: Science opens new windows on the mind. *Newsweek*, 66-70.

Begley, S. (1995, March 27). Gray matters: New technologies that catch the mind in the very act of thinking show how men and women use their brains differently. *Newsweek*, 48-54.

Begley, S. (1996, February 19). Your child's brain. *Newsweek*, 55-62.

Begley, S. (1997, Spring/Summer, Special Issue). How to build a baby's brain. *Newsweek*, 28-32.

Begley, S. and P. Wingert (1997, April 28). Teach your parents well: As research unlocks the secrets of babies' brains, families have a hard time learning the lessons. *Newsweek*, 72.

Bell, R., R. Kravitz, and M. Wilkes. (2000). Direct-to-consumer prescription drug advertising, 1989-1998. *The Journal of Family Practice, 49(4)*, 329-335.

Bratich, J., J. Packer, and C. McCarthy (2003). Governing the present. In J. Bratich, J. Packer and C. McCarthy (Eds.), *Foucault, cultural studies, and governmentality* (pp. 3-22). Albany: State University of New York Press.

Brazier, M. (1984). *A history of neurophysiology in the 17th and 18th centuries*. New York: Raven Press.

Bruer, J.T. (1999). *The myth of the first three years*. New York: The Free Press.

Bush, L. (2001, July 26). Mrs. Bush's Remarks at the White House Summit on Early Childhood Cognitive Development. Retrieved February 19, 2006 from http://www.whitehouse.gov/firstlady/news-speeches/print/fl20010726.html.

Cappa, S. (2001). *Cognitive neurology: An introduction*. London: Imperial College Press.

Carey, B. (2005, October 18). Can brain scans see depression? *New York Times*. Retrieved December 15, from http://www.nytimes.com.

Carnall, D. (1999). American Medical Association moves to regulate prescribing on the internet. *British Medical Journal, 319 (7204)*, 213.

Carnegie Corporation. (1994). *Starting points: Meeting the needs of our youngest children*. New York: Carnegie Corporation of New York.

Carter, R. (1998). *Mapping the mind*. Berkeley: University of California Press.

Cartwright, L. (1995). *Screening the body: Tracing medicine's visual culture*. Minneapolis: University of Minnesota Press.

Changeux, J.P. (1985). *Neuronal man* (Trans. Laurence Garey). New York: Pantheon. (Original work published in 1983).

Chatterjee, A. (2004). Cosmetic neurology: The controversy over enhancing movement, mentation and mood. *Neurology 63*, 968-974.

Clarke, E. and L.S. Jacyna. (1987). *Nineteenth century origins of neuroscientific concepts*. Berkeley: University of California Press.

Clinton, B. (1997, April 17). Remarks at the opening of the White House Conference on Early Childhood Development and Learning.

Clinton, B. (1997, March 13). Statement announcing the White House Conference on Early Childhood Development and Learning. Retrieved February 19, 2006 from http://www.ed.gov/PressReleases/04-1997/970417d.html.

Clinton, H. (1996). *It takes a village*. New York: Touchstone Books.

Clinton, H. (1997, April 17). Remarks by the First Lady at the White House Conference on Early Childhood Development and Learning. Retrieved February 19, 2006 from http://clinton3.nara.gov/WH/New/ECDC/About.html.

Cloud, D. (1998). *Control and consolation in American culture and politics: Rhetoric of therapy*. London: Sage Publications.

Collins, J. (1997, February 3). The day-care dilemma. *Time,* 58-62.

Condit, C. (1999a). *The meanings of the gene*. Madison: University of Wisconsin Press.

Condit, C. (1999b). The materiality of coding. In J. Selzer and S. Crowley (Eds.), *Rhetorical bodies* (pp. 326-256). Madison: The University of Wisconsin Press.

Condit, C., et al. (2002). Recipes or blueprints for our genes? How contexts selectively activate the multiple meanings of metaphors. *Quarterly Journal of Speech, 88,* 303-325.

Connolly, W. (2002). *Neuropolitics*. Minneapolis: University of Minnesota Press.

Conrad, P. and J. Schneider. (1992). *Deviance and Medicalization: From Badness to Sickness* (2nd ed.). Philadelphia: Temple University Press.

Cole, W. (1998, October 19). Lighten up, folks: Are you piping Mozart into the crib and reading Dr. Seuss around the clock? Relax: to develop a baby's brain, more input isn't always better. *Time,* 88-89.

Coyle, K. and D. Grodin. (1993). Self-help books and the construction of reading: Readers and reading in textual representation. *Text & Performance Quarterly, 13(1)*, 61-79.

Damasio, A. (1994). *Descartes' Error*. New York: Avon Books.

Damasio, H. and R. Frank (1992). Three dimensional *in vivo* mapping of brain lesions in humans. *Archives of Neurology 49*, 137-43.

Dean, M. (1996). Foucault, government, and the enfolding of authority. In A. Barry, T. Osborne, and N. Rose (Eds.), *Foucault and political reason* (pp. 209-233). London: UCL Press.

DeLanda, M. (1992). Nonorganic life. In J. Crary and S. Kwinter (Eds.), *Incorporations* (pp. 129-143). New York: Zone.

DeLuca, K. (1999a). Articulation theory: A discursive grounding for rhetorical practice. *Philosophy and Rhetoric, 32(4)*, 334-348.

DeLuca, K. (1999b). *Image politics*. New York: Guilford.

Deleuze, G. (1988a). *Spinoza: Practical philosophy*. New York: City Lights.

Deleuze, G. (1988b). *Foucault* (Trans. Sean Hand). Minneapolis: University of Minnesota Press. (Original work published in 1986).

Deleuze, G. (1990). *The Logic of Sense* (Trans. Mark Lester). New York: Columbia University Press. (Original work published in 1969).

Deleuze, G. (1995). *Negotiations, 1972-1990* (Trans. M. Joughin). New York: Columbia University Press. (Original work published in 1990).

Deleuze, G. and C. Parnet (2002). *Dialogues II* (Trans. H. Tomlinson and B. Habberjam). New York: Columbia University Press. (Original published in 1977).

Dolby, C. (2005). *Self-help books: Why Americans keep reading them*. Urbana: University of Illinois Press.

Doyle, R. (1997). *On beyond living: Rhetorical transformations of the life sciences*. Stanford: Stanford University Press.

Dumit, J. (2004). *Picturing personhood: Brain scans and biomedical identity*. Princeton: Princeton University Press.

Ebben, M. (1995). Off-the-shelf salvation: A feminist critique of self-help. *Women's Studies in Communication, 18(2)*, 111-122.

Edelman, G. (1995). Memory and the individual soul: Against silly reductionism. In J. Cornwell (Ed.), *Nature's imagination: The frontiers of scientific vision* (pp. 200-206). Oxford: Oxford University Press.

Engelhardt, H. and A. Caplan, (Eds.). (1987). *Scientific controversies: Case studies in the resolution and closure of disputes in science and technology*. Cambridge: Cambridge University Press.

Farrell, T. and T. Goodnight. (1981). Accidental rhetoric: The root metaphors of Three Mile Island. *Communication Monographs, 48*, 271-300.

Finger, S. (1994). *Origins of neuroscience: A history of explanations into brain function*. New York: Oxford University Press.

Finnegan, C. (2005). "Recognizing Lincoln: Image vernaculars in nineteenth-century visual culture." *Rhetoric & Public Affairs 8*, 31-58.

Flaxman, G. (2000). Introduction. In G. Flaxman (Ed.), *The brain is the screen: Deleuze and the philosophy of cinema* (pp. 1-60). Minneapolis: University of Minnesota Press.

Fodor, J. (1983). *The modularity of mind*. Cambridge: MIT Press.

Foss, S., K. Foss and R. Trapp (2001). *Contemporary perspectives on rhetoric*. (3rd ed.). Waveland Press.

Foucault, M. (1970). *The order of things*. New York: Vintage. (Original work published in 1966).

Foucault, M. (1977). *Discipline and punish*. New York: Vintage. (Original work published in 1975.

Foucault, M. (1978). *The History of Sexuality* (R. Hurley, Trans. Vol. 1). New York: Pantheon.

Foucault, M. (1983). The subject and power. In H. Dreyfus and P. Rabinow (Eds.), *Michel Foucault: Beyond Structuralism and Hermeneutics, 2nd ed.* (pp. 208-228). Chicago: The University of Chicago Press.

Foucault, M. (1988). Technologies of the self. In L. Martin, H. Gutman and P. Hutton (Eds.), *Technologies of the self: A seminar with Michel Foucault* (pp. 16-48). Amherst: The University of Massachusetts Press.

Foucault, M. (1989). Introduction. In G. Canguilhem, *The Normal and the Pathological* (Trans. C. Fawcett) (pp. 7-24). New York: Zone.

Foucault, M. (1991a). Governmentality. In G. Burchell, C. Gordon, and P. Miller (Eds.), *The Foucault effect: Studies in governmentality* (pp. 87-104). Chicago: University of Chicago Press.

Foucault, M. (1991b). Questions of method. In G. Burchell, C. Gordon, and P. Miller (Eds.), *The Foucault effect: Studies in governmentality* (pp. 73-86). Chicago: University of Chicago Press.

Foucault, M. (1997). Technologies of the self. In *Ethics: Subjectivity and truth, Essential works of Foucault, 1954-1984* (Vol. I), ed. Paul Rabinow. New York: The New Press.

Frerking, B. (1997, April 18). Scientists stress need to aid parents. *Plain Dealer (Cleveland)*, 12A.

Friedman, L. (2004). Through the looking glass: Medical culture and the media. In L. Friedman (Ed.), *Cultural Sutures: Medicine and media* (pp. 1-14). Durham: Duke University Press.

Fukuyama, F. (1992). *The end of history and the last man*. New York: Avon.

Gardner, H. (1987). *The mind's new science: A history of the cognitive revolution*. New York: BasicBooks. (Original work published in 1985).

Gazzaniga, M., R. Ivry and G. Mangun. (1998). *Cognitive neuroscience: The biology of the mind*. New York: W.W. Norton & Company.

Gieryn, T. (1983). Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists. *American Sociological Review*, *48*, 781-795.

Gilman, S. (1988). *Disease and representation: Images of illness from madness to AIDS*. Ithaca: Cornell.

Gilman, S. (1995). *Health and illness: Images of difference*. London: Reaktion Books Ltd.

Goodnight, T. (1982). The personal, technical and public spheres of argument: A speculative inquiry into the art of public deliberation. *Journal of the American Forensic Association*, *18*, 214-227.

Gorman, C. and A. Park. (2002, October 7). The new science of headaches. *Time*, 76-82.

Greco, M. (1993). The duty to be well: Personal agency within medical rationality. *Economy and Society, 22(3)*, 357-372.

Greene, R. (1998). Another materialist rhetoric. *Critical Studies in Media Communication, 15(1)*, 21-40.

Grodin, D. (1991). The interpreting audience: The therapeutics of self-help book reading. *Critical Studies in Mass Communication 8(4)*, 404-421.

Grodin, D. (1995). Women reading self-help: Themes of separation and connection. *Women's Studies in Communication, 18(2)*, 123-134.

Gross, C.G. (1998). *Brain, vision, memory: Tales in the history of neuroscience*. Cambridge: The MIT Press.

Hancock, L. and P. Wingert. (1997). The new preschool. *Newsweek* (Spring/Summer special issue), 36-39.

Haraway, D. (1976/2004). *Crystals, fabrics and fields: Metaphors that shape embryos*. Berkeley: North Atlantic Books.

Haraway, D. (1991). *Simians, cyborgs and women: The reinvention of nature*. New York: Routledge.

Hardt, M. and A. Negri (2000). *Empire*. Cambridge: Harvard University Press.

Hardt, M. and A. Negri (2004). *Multitude*. New York: The Penguin Press.

Hayles, N.K. (1999). *How we became posthuman*. Chicago: University of Chicago Press.

Healy, D. (1997). *The antidepressant era*. Cambridge, Mass.: Harvard University Press.

Hooper, J. (1996). Targeting the brain: The 3-lb. organ that rules the body is finally giving up its secrets. Goodbye, Oedipus. *Time*, (Fall, special issue), 47-50.

Hutton, P. (1988). Foucault, Freud and the technologies of the self. In L. Martin, H. Gutman and P. Hutton (Eds.), *Technologies of the self: A seminar with Michel Foucault* (pp. 121-144). Amherst: The University of Massachusetts Press.

Johnson, S. (2004). *Mind wide open: your brain and the neuroscience of everyday life*. New York: Scribner.

Kantrowitz, B. (1997, Spring/Summer, Special Issue). Off to a good start: Why the first three years are so crucial to a child's development. *Newsweek*, 7-9.

Kass, L. R. (2003). "Letter of Transmittal to the President." In *Beyond therapy: Biotechnology and the pursuit of happiness* (pp. xv-xviii). Washington, D.C.: The President's Council on Bioethics.

Kawashima, R. (2005). *Train your brain: 60 days to a better brain*. Kumon Publishing.

Keller, E.F. (2002). *Making sense of life: Explaining biological development with models, metaphors and machines*. Cambridge: Harvard University Press.

Kevles, B. (1997). *Naked to the bone: Medical imaging in the twentieth century*. New Brunswick, NJ: Rutgers University Press.

Kluger, J. and A. Park. (2001, April 30). The quest for a superkid. *Time*, 50-55.

Kramer, P. (1993). *Listening to Prozac*. New York: Penguin.

Kravitz, R. (2005, April 27). Influence of patients' requests for direct-to-consumer advertised antidepressants: A randomized controlled trial. *Journal of the American Medical Association, 293 (16)*, 1995-2002.

Kuhl, P. (2001, July 26). Born to learn: Language, reading and the brain of the child. Transcript of address at the White House Summit on Early Childhood Cognitive

Development. Retrieved on February 19, 2006 from http://www.ed.gov/print/news/pressreleases/2001/07/07262001-kuhl.html.

Laclau, E. and C. Mouffe. (1985). *Hegemony & socialist strategy: Towards a radical democratic politics*. New York: Verso.

Latour, B. (1998). On more turn after the social turn . . . In M. Biagioli (Ed.), *The science studies reader* (pp. 276-289). New York: Routledge.

Latour, B. (2004). *Politics of nature: How to bring the sciences into democracy* (Trans. C. Porter). Cambridge: Harvard University Press.

Leary. D. (Ed.) (1990). *Metaphors in the history of psychology*. New York: Press Syndicate of the University of Cambridge.

Leahey, T.H. and G.E. Leahey. (1983). *Psychology's occult doubles: Psychology and the problem of pseudoscience*. Chicago: Nelson-Hall.

Lessl, T. (1988). Heresy, orthodoxy, and the politics of science. *Quarterly Journal of Speech, 74*, 18-34.

Lessl, T. (1989). The priestly voice. *Quarterly Journal of Speech, 89*, 183-197.

Lichterman, P. (1992). Self-help reading as thin culture. *Media, Culture & Society, 14(3)*, 421-448.

Lynch, M. and S. Woolgar, eds. (1990). *Representation in scientific practice.* Cambridge: MIT Press.

Lyne, J. and H. Howe (1990). The rhetoric of expertise: E.O. Wilson and sociobiology. *Quarterly Journal of Speech, 76*, 134-151.

McGee, M. C. (1982). A materialist’s conception of rhetoric. In R. McKerrow (Ed.), *Explorations in rhetoric: Studies in honor of Douglas Ehninger*. Glenview, IL: Scott, Foresman and Company.

McGee, M.C. (1998). The postmodern condition. In C. Corbin (Ed.), *Rhetoric in postmodern America: Conversations with Michael Calvin McGee*. New York: Guilford.

McGee, M. (2005). *Self-help, Inc.: Makeover culture in American life*. Oxford: Oxford University Press.

McHenry, L.C. (1969). *Garrison’s history of neurology*. Springfield, IL: Charles C. Thomas Publishing.

Melmed, M. (2005, August 29/September 5). Informed or overloaded (Letter). *Newsweek*, 18.

Mitchell, G. (2000). *Strategic deception: Rhetoric, science and politics in missile defense advocacy*. East Lansing” Michigan State University Press.

Montgomery, S.L. (1996). *The scientific voice*. New York: Guilford.

Moughty, S. (2002). The zero-to-three debate: A cautionary look at turning science into policy. *Frontline* (website), accessed on December 19, 2005 at http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/science/zero.html.

Nadesan, M.H. (2002). Engineering the entrepreneurial infant: Brain science, infant development toys, and governmentality. *Cultural Studies, 16(3)*, 401-432.

Nagel, T. (1974/2000). What is it like to be a bat? Reprinted in D. Hofstader and D. Dennett (Eds.), *The mind’s eye: Fantasies and reflections on self and soul* (pp. 391-402). New York: Basic Books.

Nash, J.M. (1997, February 3). Fertile minds. *Time*, 48-56.

National Institute of Mental Health (2005). Statistics. Retrieved March 13, 2006 at http://www.nimh.nih.gov/HealthInformation/statisticsmenu.cfm.

Newsweek. (1997). Your child from birth to three. Special ed. Spring-summer.

Newsweek. (2005, August 15). Your baby's brain. Cover.

Niehoff, D. (2005). *The language of life: How cells communicate in health and disease*. Washington, DC: Joseph Henry Press.

Orban, G. and W. Singer (Eds.). (1991). *Cognitive neuroscience: Research directions in cognitive science.* Lawrence Erlbaum Associates.

Pepperell, R. (2003). *The posthuman condition: Consciousness beyond the brain*. Intellect Ltd.

Pinker, S. (2002). *The blank slate*. New York: Viking.

Polger, T. and O. Flanagan. (1999). Natural answers to natural questions. In V.G. Hardcastle (Ed.), *Where biology meets psychology: Philosophical essays* (pp. 221-247). Cambridge: The MIT Press.

Posner, M.I. and M. Raichle. (1994). *Images of mind*. New York: Scientific American Library.

Quartz, S. and T. Sejnowski. (2002). *Liars, lovers and heroes: What the new brain science reveals about how we become who we are*. New York: William Morrow.

Quinn, J. (1999, March 1). Get a "life." The year begins with self-help successes. *Publishers Weekly*, 25-6.

Rabinow, P. (1998). Artificiality and enlightenment: From sociobiology to biosociality. In *The science studies reader*, ed. M. Baglio. New York: Routledge.

Raichle, M. (1998). Behind the scenes of functional brain imaging: A historical and physiological perspective. *Proceedings of the National Academy of Scientists, 95,* 765-772.

Ramachandran, V.S. and S. Blakeslee. (1998). *Phantoms in the brain: Probing the mysteries of the human mind*. New York: William Morrow.

Reiner, R. (1997).

Restak, R. (1994). *The modular brain*. New York: Touchstone.

Restak, R. (2001a). *Mozart's brain and the fighter pilot: Unleashing your brain's potential*. New York: Harmony Books.

Restak, R. (2001b). *The secret life of the brain*. Washington, DC: Joseph Henry Press.

Restak, R. (2003). *The new brain: How the modern age is rewiring your mind*. Rodale Inc.

Rosenberg, D. (1997). Raising a moral child. *Newsweek* (Spring/Summer special issue), 92-93.

Sacks, O. (1995). A new vision of the mind. In J. Cornwell (Ed.), *Nature's imagination: The frontiers of scientific vision* (pp. 101-121). Oxford: Oxford University Press.

Salerno, S. (2005). *Sham: How the self-help movement made America helpless*. New York: Crown Publishers.

Salzman, B., J. Carberry, and K. Hall. (2005, August 29/September 5). Letter. *Newsweek,* 18.

Santrock, J.W., A.M. Minnett, and B.D. Campbell (1994). *The authoritative guide to self-help books*. New York: Guilford.

Schwartz, J.M. (1996). *Brain lock: A four-step method to change your brain chemistry*. New York: ReganBooks.

Schwartz, J.M. and S. Begley. (2002). *The mind & the brain: Neuroplasticity and the power of mental force*. New York: ReganBooks.

Schwenck, T. (2005). Influence of direct-to-consumer advertising on antidepressant prescriptions. *Archives of Disease in Childhood 90(8),* 874.

Searle, J. (1984). *Minds, brains and science*. Cambridge: Harvard University Press.

Slack, J.D. (2005). Why the biotechnological body matters: Introduction to the special issue. *Communication Theory*, *15(1)*, 5-9.

Stafford, B. (1996). *Good looking: Essays on the virtue of images*. Cambridge: The MIT Press.

Star, S.L. (1989). *Regions of the mind: Research and the quest for scientific certainty*. Palo Alto, CA: Stanford University Press.

Stern, M.R. (1971). *Heads & headlines: the phrenological Fowlers*. Norman: University of Oklahoma Press.

Sternberg, R.J. (1990). *Metaphors of mind: Conceptions of the nature of intelligence*. Cambridge: Cambridge University Press.

Stormer, N. (2004). Articulation: A working paper on rhetoric and *taxis*. *Quarterly Journal of Speech 90(3)*, 257-284.

Taylor, C. (1991). Defining the scientific community: A rhetorical perspective on demarcation. *Communication Monographs, 58*, 402-420.

The President’s Council on Bioethics. (2003). *Beyond therapy: Biotechnology and the pursuit of happiness*. Washington, D.C.: Author.

Thompson, T. (2001, July 26). Address at White House Summit on Early Childhood Cognitive Development. Retrieved February 19, 2006 from ed.gov.

Tiede, T. (2001). *Self-help nation*. New York: Atlantic Monthly Press.

Turner, F.J. (1920/1986). *The frontier in American history*. Tucson: University of Arizona Press.

Turning, A. (1950). Computing machinery and intelligence. *Mind, LIX (236).*

Uttal, W. (2001). *The new phrenology: The limits of localizing cognitive processes in the brain*. Cambridge: MIT Press.

Van Dijck, J. (2005). *The transparent body: A cultural analysis of medical imaging*. Seattle: University of Washington Press.

Van Orden, G.C. and K. Paap. (1997). Functional neuroimages fail to discover pieces of the mind in the parts of the brain. *Philosophy of Science 64*, S85.

Waldby, C. (2000a). The Visible Human Project: Data into flesh, flesh into data. In J. Marchessault and K. Sawchuck (Eds.), *Wild science: Reading feminism, medicine and the media* (pp. 24-38). New York: Routledge.

Waldby, C. (2000b). *The Visible Human Project: Informatic bodies and posthuman medicine*. New York: Routledge.

White House conference melds neuroscience and public policy. (1997). *Neuroscience Newsletter*, July/August.

White House Summit on Early Childhood Learning concludes with call to spread latest findings and announcement on new federal effort. (2001, July 27). Retrieved on February 19, 2006 from ed.gov.

White House Summit on Early Childhood Cognitive Development (2001). Retrieved February 19, 2006 from http://www.whitehouse.gov/firstlady/initiatives/education/text/readingprograms.html.

Wilson, E. (1998). *Neural geographies: Feminism and the microstructure of cognition*. New York: Routledge.

Wilson, E.O. (1998). *Consilience: The unity of knowledge*. New York: Vintage.

Wingert, P. and A. Underwood. (1997). First steps: Hey—look out world, here I come. *Newsweek* (Spring/Summer special issue), 12-15.

Woodstock, L. (2005). Vying constructions of reality: Religion, science, and "positive thinking" in self-help literature. *Journal of Media & Religion, 4(3)*, 155-178.

Young, R.M. (1990). *Mind, brain and adaptation in the nineteenth century*. New York: Oxford University Press. (Original work published in 1970).

Zigler, E., M. Finn-Stevenson, and N. Hall. (2002). *The first three years & beyond: Brain development and social policy*. New Haven: Yale University Press.

Zimmer, C. (2004). *Soul made flesh: The discovery of the brain—and how it changed the world*. New York: The Free Press.

Zizek, S. (2004). *Organs without bodies*. New York: Routledge.