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Neuroscience, Government and Babies' Brains

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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.

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