

## CHAPTER I

*Science Does Not Speak for Itself*

Parents in the 1990s had many things to think about besides making sure that the children were healthy, safe, and growing. “Is day care bad for babies?” had been a continuing question for more than a decade as researchers, opinion leaders, and, yes, politicians voiced their judgments. The V-chip was leading many parents to consider installing this device on their televisions to block programming containing violent, sexual, or “indecent” content. Worries about whether their young children would be socially ready for kindergarten, about whether their grade-schoolers would be popular with peers, and about preparing their sons and daughters for life in a world of changing gender roles joined Barney’s theme song in parents’ minds in the 1990s.

Fast-forward to the new millennium, we find that things have changed and things have stayed the same. The question of whether day care is bad for babies remains, but it has been supplemented by the question of whether early childhood education is necessary for school readiness because of the rapid pace of early brain development. In preparing children for a world of changing gender roles, parents today are informed by books like *Pink Brain, Blue Brain*<sup>1</sup> that gender roles are captured in differences in the brain’s organization and functioning. Today parental concerns about kindergarten are focused not on social readiness but on whether their children have the cognitive and self-regulatory skills – that is, school readiness – to succeed. TV for children remains a concern, now because of its potential effects on the developing brain.<sup>2</sup> Parents today are still devoted to making sure that the children are healthy, safe, and growing, and dietary recommendations today inform parents how much children need carbohydrates, fatty acids, and antioxidants for brain growth. Infant formula companies like Nestlé advertise their baby formula as containing nutrients that are “essential for a healthy brain.”<sup>3</sup>

Brain development occupies parents’ thoughts today in other ways. Milestones in children’s developing behavior or thinking are presented as

indicators of brain growth. (“These ‘social smiles’ . . . are heartwarming, but they’re also a sign that the parts of your baby’s brain that control eyesight and muscle movements are booting up.”<sup>4</sup>) Parents cannot miss the advertisements urging them to talk, read, and sing to their infants to strengthen regions of the brain governing language, even before babies have uttered their first word. They also cannot miss the references to “toxic stress” deriving from trauma and adversity and its effects on the brain’s emotion and coping capacities. And accounts from research on adolescent brain development tell parents what to expect from their teen’s neurobiological capacities for impulse control and self-regulation (not much). When the seventh edition of Benjamin Spock’s classic *Baby and Child Care* appeared in 1998, there were two pages devoted to the development of the brain. By the time the tenth edition was published in 2018, the index referenced more than thirty-five pages devoted to the brain, including topics such as anxiety disorders, gender, intelligence, and puberty. A similar evolution has occurred in popular magazines like *Parents*, reflecting the growing interest of its readers in the developing brain and how it is affected by experience at home. In the 1990s, few parents thought much about the developing brain. By 2017, a national survey with oversampling of parents of young children reported that 93% believed that brain development in babies and young children is important.<sup>5</sup> There has been a revolution in thinking about brain development.

The new way of understanding children deriving from the brain development revolution has affected not only parents but all of us – including, of course, children themselves. Building on public interest in brain development, for example, the Pew Charitable Trusts in 2001 inaugurated a national campaign for prekindergarten education, and helped create the Partnership for America’s Economic Success to mobilize business leaders around the early education agenda.<sup>6</sup> This contributed to legislative activity in conservative states like Florida and in progressive states like Vermont to institute universal prekindergarten programs for four-year-olds, joining the majority of states that now provide public funding for prekindergarten.<sup>7</sup> The Biden administration in 2021 proposed universal pre-K as a cornerstone of the American Family Plan proposed to provide pandemic relief. Other states, such as California, Arizona, and Arkansas, passed voter initiatives to supplement early education programs with a rich variety of other services including health screening, prenatal care, and parent support programs. The preparation of professionals who work with children from infancy through adolescence has also changed to incorporate ideas from developmental neuroscience. For example, Zero to Three, a national

*Science Does Not Speak for Itself*

3

nonprofit, developed *The Growing Brain*, a curriculum for child care providers, Head Start teachers, and other early childhood professionals to help them connect children's developing thinking and behavior to changes in brain development.<sup>8</sup> Commercial manufacturers have also caught the brain development message. They are marketing products for all ages advertised to train the brain, ranging from baby toys to online programs like Lumosity<sup>9</sup> to promote cognitive acuity, especially in older adults. These applications of the brain development message were first observed in the United States, which is the focus of this book, but similar policy, commercial, and advocacy efforts have appeared throughout much of the world.

And what have been the benefits of all this attention for children? A fuller accounting follows, but some consequences are unmistakable. For one, national attention to early learning, sharpened by the research on early brain development, has changed young children's experience in school. In one study, 2,500 kindergarten teachers responded to the Department of Education's Early Childhood Longitudinal Study survey in 1998 and in 2010.<sup>10</sup> Teachers were asked about their expectations for children's learning, their regular classroom practices, and their assessments of student outcomes. The survey showed that kindergarten teachers in 2010 held far higher academic expectations for children than in 1998. They also devoted more time to literacy and math skills, and to conducting outcome assessments such as standardized tests – and significantly less time to science topics, geography and cultures, art, music, and dramatic play. Moreover, kindergarten teachers in 2010 reported significantly more reliance on teacher instruction and worksheets over child-selected activities that follow young children's curiosity. One reason for these differences was teacher expectations for student achievement. On the question of whether most children should learn to read in kindergarten, for example, 31% of teachers agreed in 1998, but 80% did in 2010. The title of the article reporting these findings asked: "Is Kindergarten the New First Grade?" The researchers concluded that it is.

To be sure, it would be unfair to attribute these changes exclusively to new understanding of the developing brain. During the twelve years between 1998 and 2010, public education in the United States changed with the movement for standards-based education inaugurated by the No Child Left Behind Act of 2001 and the development of the Common Core standards that were adopted by most states. But with growing numbers of young children having experience in preschool and prekindergarten programs, owing in part to parents' concerns with stimulating early cognitive

growth, research has shown that children’s performance in kindergarten improved and increased teachers’ expectations accordingly.<sup>11</sup> And the increase in early education<sup>12</sup> along with increased expectations for children’s achievement are both connected by a new regard for early learning inspired by the scientific account of early brain development.

More broadly, more than twenty-five years of public interest in brain development has resulted in much greater attention to the influences that can help or harm the developing brain – stimulation, adversity, nurturance, stress, nutrition – by a far wider audience than has ever before been interested in children’s development in the early years. And this has contributed to new ways of thinking about young children themselves, including a new appreciation of their sensitivity to the world around them. On the positive side, greater public funding for early childhood programs and greater public attention to the risks posed by early exposure to adverse childhood experiences (ACEs), trauma, and chronic stress at all ages reflect renewed concern for the opportunities and vulnerabilities of early childhood that the brain development framework has helped to highlight. There is no question that public awareness of the value and importance of early childhood education has grown, together with the availability of programs (of varying quality) to meet this increased demand. On the less positive side, the brain development message has provided a scientific justification for viewing “investments” in children’s brain growth as a strategic investment in future prosperity<sup>13</sup> that has contributed, among the affluent, to greater high-intensity (also known as helicopter) parenting and, among the rest of us, to measuring the yield of early childhood programs in conventional indicators of cognitive achievement and school success rather than social competence and emotional well-being.

This book is an account of the brain development revolution and how it came to dominate public regard for childhood and development. Public attention was captured by the *I Am Your Child* campaign in 1997, and within a few short years its message changed how parents and other adults thought about children and their developmental potential. The campaign’s watchword – “the first years last forever” – was not how most people thought about early childhood before 1997 when the school years, not early childhood, were viewed as developmentally formative. But the enduring legacy of early experience quickly became a truism that influenced how parents thought about their impact on the developing brain, helped propel a national movement for early education, mobilized concerns over the effects of stress and trauma on brain development, and encouraged businesses to advertise their products as beneficial for brain

growth. The brain development revolution has also had extended influence, such as on Supreme Court decisions concerning adolescent responsibility and the design of brain-based programs for grade-schoolers to promote learning and achievement. It is a revolution in public understanding that has incorporated science, its dissemination in the media, and its implications for public policy.

The brain development revolution is important not only because it has contributed new scientific understanding of children's growth but also because it has provided new ideas, images, and metaphors that shape our thinking about what children are like. Throughout history, images and metaphors have been powerful avenues for articulating and changing central cultural beliefs about children and their characteristics. The images of children prevalent at a particular moment in time incorporate dominant cultural constructions of childhood, and the introduction of new images can highlight new needs, capabilities, or other characteristics of childhood that can be the foundation for changes in how children are regarded and treated. The brain development revolution is important not just for the knowledge it conveyed but also for new ways of thinking about children that it communicated.

### What Is a Child?

I would compare it to like a baby tree growing. If you give it a strong foundation to grow straight, it'll grow straight... If you build a good foundation for them while they're at this age, like before five, I believe that you'll see it as they get older.

—Angelo, the father of a young child in Chicago, interviewed in 2015<sup>14</sup>

What comes to mind when you think of a child? Do you imagine a plant poking up from the ground, cultivated by warm sun, the earth, and water? Or perhaps a building being constructed on a solid foundation? Does your image of a child look like a bubbling cauldron of impulses and emotions? Or perhaps a ball of clay awaiting the shaping of experience and nurturant care? And what do you think of when considering supporting a child's development? Is it like taming a wild animal? Cultivating a garden? Protecting an innocent? Building a strong structure? Training a loved pet? Making an investment in the future?

Our images and metaphors for childhood, like Angelo's, have always affected how adults think about children's characteristics and needs. They shape how parents view their responsibilities and orient their greatest concerns. They also influence how a society creates incentives and

structures for institutions to guide children's development.<sup>15</sup> But different metaphors have prevailed at different times in history. Consider the following:

[I]n children may be observed the traces and seeds of what will one day be settled psychological habits, though psychologically a child hardly differs for the time being from an animal. (Aristotle 350 BCE)<sup>16</sup>

The little, and almost insensible impressions on our tender infancies, have very important and lasting consequences; and there 'tis, as in the fountains of some rivers where a gentle application of the hand turns the flexible waters into channels, that make them take quite contrary courses, and by this little direction given them at first in the source they receive different tendencies and arrive at last at very remote and distant places. (John Locke 1693)<sup>17</sup>

Love childhood; encourage its sports, its pleasures, its lovable instincts. Who among us has not at times looked back with regret to the age when a smile was continually on our lips, when the soul was always at peace? (Jean-Jacques Rousseau 1762)<sup>18</sup>

It being a part of Mrs. Pipchin's system not to encourage a child's mind to develop and expand itself like a young flower, but to open it by force like an oyster. (Charles Dickens 1848)<sup>19</sup>

Children are completely egoistic; they feel their needs intensely and strive ruthlessly to satisfy them. (Sigmund Freud 1899)<sup>20</sup>

Give me the baby and my world to bring it up in and I'll make it crawl and walk; I'll make it climb and use its hands in constructing buildings of stone or wood. I'll make it a thief, a gunman or a dope fiend. The possibilities of shaping in any direction are almost endless... [M]en are built, not born. (John Watson 1928)<sup>21</sup>

Each of these statements, different as they are, reflects dominant beliefs about children that were prevalent during different periods in Western history. The Aristotelian view of children as animalistic was consistent with many ancient views that esteemed mature competencies and virtues and regarded children as sadly bereft of these. It is usually true, in fact, that when children's characteristics are measured against those of adults they are found lacking, but there are exceptions. Rousseau's celebration of childhood in its natural condition was a reaction, in part, to the decadent excesses of the French society in which he lived. He esteemed childhood because it reflected the quality of the natural person before the corrupting effects of the culture and, indeed, *Emile* is instructional for how children

should be protected from these vices. An equally radical departure from traditional views of children is the Lockean portrayal of a child's natural tendencies being redirected by the guidance of parental instruction and education to chart the child's future course.

Both Lockean and Rousseauian views were departures from traditional views and had important cultural influence. The images of childhood innocence of Rousseau and the Romantics in the mid-eighteenth century softened prevalent beliefs about children's sinfulness from Christian theology. They also contributed, somewhat later, to sanctions on cruelty to children. The Lockean portrayal of a child as a *tabula rasa* (blank slate) awaiting the imprimatur of nurturance and education was equally contrary to traditional views of children's (largely negative) natural tendencies, and contributed to the movement for public education of the nineteenth century. The writing of social reformers like Charles Dickens and Victor Hugo in the nineteenth century, who dramatized the conflict between children's developmental needs and their harsh treatment in factories, mines and other institutions, led to the movement against child labor and for public education.<sup>22</sup> As images and metaphors for childhood have evolved, the social conditions that shape the experience of children have changed accordingly.

It is tempting to regard these images and metaphors of childhood as progressive advances toward the contemporary portrayal of children, such as the one by Angelo, that opens this section. But that would be mistaken. Rather, these views of children – as animalistic, shaped by education and experience, egoistic, innocents in a corrupt world – all continue to be influential long after their initial emergence because they justify practices and policies toward children, from punitive parenting to progressive education, that have contemporary resonance. They remain a continuing strand in the tapestry of current beliefs about children and their development. Aristotle might have found Freud's dictum in 1899 congenial to his own views (although Freud had much more to say that the ancient philosopher would have found incomprehensible), and the Lockean focus on education was embraced by the social reformers a century later and by contemporary early education advocates. These metaphors and images of childhood emerged from the historical times in which they were influential as they captured new public sentiments and beliefs, and they provoked new ways of treating children, but they remain part of our continuing social construction of childhood.

But something changed with the dawn of the twentieth century. Now the metaphors and images portraying children began to have their origins

not in philosophy or literature, but in psychological science. The century began with a focus on the unconscious and ended with a focus on genetics and neuroscience.<sup>23</sup> And as the century proceeded, other images of the developing child also emerged, such as the little scientist expressed in Jean Piaget's theory,<sup>24</sup> the child as a sophisticated computational machine from cognitive science, and the image of a DNA blueprint capturing the view of the child as genetically predetermined. For more than a century, most of the dominant images and metaphors for child development have had their origins in psychology, human development, and related scientific fields.

And this has had consequences for how people think about children. For one, these twentieth-century images have required that experts explain their meaning and practical significance to parents, practitioners, and others informed by them. It was not (and may still not be) at all obvious, for example, how the unconscious is relevant to comprehending children's motives or feelings. But fortunately a corps of psychoanalytically oriented clinicians, academics, and popular writers provided guidance to an interested public as Freudian theory reached the shores of the United States with the arrival of European scholars in the years leading up to World War II. John Watson, an earlier founder of behaviorism (recall "men are built, not born"), wrote a best-selling guide for parents, *Psychological Care of Infant and Child*,<sup>25</sup> which eager parents read in order to benefit from the latest scientific understanding of children and how they should be raised. With the discovery of Piaget's theory in the United States in the early 1960s,<sup>26</sup> developmental psychologists and educators quickly applied his fourfold stages of cognitive development and his constructivist ideas to everything from language to numerical reasoning to moral judgment.

And as the meaning of these and other images of child development from psychological science gradually became better understood, they had a profound influence on children's lives in the twentieth century. Piaget's theory and the image of the child-as-scientist equipped parents and teachers with a new appreciation of how children construct their own understanding from everyday experience – not just tutelage – and this reformed classroom practice. Behavioral genetics gave parents an awareness of how much children's characteristics owe to their genetic endowment that balanced the dominant view of the 1980s that parents are responsible for the character and behavior of their offspring.

These images and metaphors became influential because they captured truths that were intuitively sensible and scientifically supported, and because they were interpreted by experts who were authoritative. They



*Science Does Not Speak for Itself*

9

were, in other words, persuasive expressions of scientific understanding of how children grow and develop. And scientific claims are important because public attitudes toward science (and scientists) are very positive. According to national survey findings from December 2021 reported by the Pew Research Center, 77% of Americans report confidence in scientists to act in the public interest<sup>27</sup> – a proportion that has *risen* since 2016 – and a related poll showed that 63% say that the scientific method generally produces sound conclusions.<sup>28</sup> Confidence in the claims of science, and scientists, remains strong because of a shared conviction that its practitioners labor to be truth-tellers to the world.

This is especially true of the science of human development because this science is not only authoritative but also necessary.<sup>29</sup> Has anybody looked into face of a newborn baby as a newborn parent and not felt the mixture of delight, fascination, and utter terror presented by the daunting challenge of how to care for this young child? And although newborn parents turn most often to the wisdom of grandparents, friends, and social media as their primary sources of guidance, the discoveries of developmental science are not far from their thinking. Many professionals likewise draw on this science, whether they are educators, child care providers, pediatricians, family therapists, child welfare caseworkers, or family lawyers and judges. And quite often, it is not specific study findings or even a research literature that they enlist in their work, but the broader metaphors and images of the developing child that are expressions of the child's characteristics and needs, based in the science, that provide guidance to them. Once you have grasped the metaphor of the child as a scientist, you do not have to read the research to appreciate the importance of building on a young child's prior understanding to help them learn new skills. Once you have a sense of how the brain grows, you do not have to study developmental neuroscience to begin to understand the implications of the brain's rapid development in the early years. It is these images and metaphors, deriving from developmental science and explained by the scientists (and others), that provide the bridge between research and its necessary human applications.

People pay attention to the science of human development for another reason also. By understanding how children's lives take shape, we learn more about how each of us has become the person we are today. As "the child is father of the man," in Wordsworth's evocative line,<sup>30</sup> every adult gains insight into who they are by understanding the child they once were, and how that child gradually matured into an adult. Each new way of thinking about children and their needs thus leads reflectively to the

continuing question of how each of us has come into being, and the influences that have made us who we are.

### Why Brain Development?

The inquiry that led to this book began with a simple question: How and why did brain development so quickly become the dominant lens for public understanding of child development? As a developmental psychologist, I joined my colleagues in perceiving a peculiar irony in the sudden popularity of developmental brain science in the late 1990s. Hundreds of scientific studies on the growth of children's thinking, learning, reasoning, language, memory, and their developing feelings, social understanding, and emotion management, accumulated over decades of study, provided far greater insight into the growing brain than did the fuzzy neuroimages emerging from the first yield of developmental neuroscience. After all, these mental and behavioral achievements that we had long been studying obviously occur in the brain, so these well-known developments in behavior and thinking tell us much about the growing brain from which they emerge. Yet it very quickly became apparent that the images of areas of the brain "lighting up" in color on an fMRI scan of a child's brain compelled public interest and had far greater impact than even the most groundbreaking study of behavioral development. Why was this so, and why is it still true?

One answer is that the study of the brain is new, exciting, and compelling, as the following chapters illustrate. The rapid growth in the technological sophistication of brain imaging over the past decades means that we are regularly witness to unprecedented new insights into how the brain functions, its organization, and its development over time. The public's fascination with the new discoveries about the human brain is comparable to how earlier generations were captivated by the medical advances in the early twentieth century or the midcentury dawn of the silicon revolution. These exciting achievements make the familiar methods and findings of behavioral science seem ordinary and outdated by comparison.

Another answer is that neuroscience draws on enduring Western beliefs about the material substance underlying mental processes. The study of the brain identifies the neurobiological structures that are the basis for behavior, making tangible and "real" the physical mechanisms of thinking, feeling, and acting, based on research methods that seem more the province of medicine than of psychology. The advancing technologies of developmental brain science promise further revelations of how mental