The Adolescent Brain

Reaching for Autonomy

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Chapter One

Adolescence in Contemporary Society

Being Somewhat Confused

We all meander out of childhood into adult life through an adolescent door. Some adolescents go through it relatively easily, but most stumble going over the threshold—their erratic (and alas, often erotic) stumbling being almost a rite of passage.

What's odd is that we adults so often seem surprised and even mystified when we observe adolescents confronting the same problems and doing the same foolish and destructive things we did during our own passage. We often romanticize our own adolescence because we survived it but now worry (as our parents and teachers worried about us) that our children and students won't survive their adolescence—a frequently bewildering puberty-to-maturity period that can simultaneously combine the worst and the best elements of both childhood and adulthood.

Good news: Most adolescents finally make it through the door into responsible adulthood. More good news: We now better understand the underlying biology that drives adolescent maturation.

The several-decades-long ascent of the cognitive neurosciences escalated dramatically at about the turn of the 21st century. Important scientific developments have occurred in our understanding of such central concepts as our brain's organization and extended maturation; the biology of emotion, attention, learning, memory, thought, and behavior; and brain plasticity (the physical changes that occur within our brains as we master new challenges).

Furthermore, successful new interventions for children with inadequately developing emotion, attention, and language systems emerged; and potential advances in the stem cell treatment of a wide variety of body/brain maladies sparked both political controversy and parental hope. If such scientific advances can ameliorate many of the school-related maladies that children confront, will that enhance their otherwise more difficult adolescent journey through family and school mazes? Finally, of special interest to educators and parents is the growing realization that the adolescent maturation of the brain's frontal lobes is far more important to human life than was previously known.

Although adolescence is a complex body/brain developmental phenomenon, it's useful to think of it as something that's especially focused in the maturation of our brain's frontal lobes, where we process conscious executive decisions about what to do and how to do it. Since frontal lobe researchers metaphorically compare the role and importance of our frontal lobes to a corporate CEO or a symphony conductor, adolescent frontal lobe maturation is something to be praised and not ridiculed as it fine-tunes itself into adult competence and autonomy. Autonomy doesn't emerge as easily as walking and talking. A sheltered childhood doesn't immediately translate into an independent, productive adulthood without a few exploratory mishaps along the way.

Only humans experience adolescence as an extended developmental stage, and scientists aren't sure why it should take us twice as long to mature as other primates with relatively long life spans. Cultural complexities drive much of our adolescent development, and most of the world's cultures are

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now very complex. Cultural complexity is a relatively recent development, however, and so what has occurred in the past several hundred years didn't affect human evolution. Regardless of the developmental reason, both parenting and schooling tend to shift into a different mode during adolescence—a shift away from the childhood focus on nurturing and sheltering toward a focus on at least recognizing, if not enhancing, the adolescent's inevitable reach for autonomy.

Our 20-year childhood and adolescence is actually advantageous, in that it allows us to master cultural knowledge through the extended observation of adult behavior that characterizes teaching and learning. The **mirror neuron** system and the plasticity capabilities inherent in our large **cerebral cortex** (both discussed in Chapter 2) provide the neurobiological foundation. (See the glossary, beginning on page 141, for definitions of **boldface terms.**) Parenting, schooling, and mass media provide the cultural context and the activation. Young people can thus concentrate their cognitive energies on cultural assimilation rather than on daily survival.

Geographers use an intriguing term, *adolescent stream,* to label a stream in transition in the erosion cycle. During this period, the weather and consequent water movement patterns sculpt the valley floor into what it will become. An *adolescent stream* is thus a meandering stream. It's a legitimate stream, but it's not yet what it will become.

A personal note: Like an *adolescent stream,* my wife and I meandered through our adolescence. The Introduction reported that we have seven children who also meandered through their adolescence into responsible adulthood. And we now have 20 grandchildren who are in various stages of meandering toward, through, or beyond adolescence. It was interesting to go through the experience firsthand, and then to observe two generations go through what is substantially the same experience—despite all the cultural changes that have occurred over the decades. So this book, which focuses principally on the organization, development, and nurturing of the brain that drives adolescence is based not only on the substantial emerging biological literature on adolescence but also on my extended personal experience as an adolescent, parent, grandparent, and educator.

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Adolescent meandering implies that maturity often shifts our perspective of what constitutes appropriate behavior. An acquaintance once told me that he had gone to much effort and expense to construct a beautiful stained wooden fence that enclosed the part of his corner yard that adjoined the sidewalk. The morning following its completion, he discovered that someone—he assumed an adolescent—had used an aerosol paint can during the night to *tag* the outside length of the fence with crude words and designs. He was furious. And then he recalled that he and a friend had done something similar to someone's house when they were 16, and they thought it a funny prank. I expect that today's adolescent computer hackers will similarly resent the electronic destruction of their personal and business records by future adolescent hackers.

An adolescent with immature **frontal lobes** can thus be sufficiently mature to design and carry out a complex action, but not really realize until perhaps years later that the action was inappropriate and immature. Knowing how to do something isn't the same as knowing if you should do it. The development of the positive personal moral/ethical base that's characteristic of an autonomous adult is thus a central issue that this book will explore.

To help adolescents resolve such issues in an informed manner, the adults who nurture them should develop at least a functional understanding of the underlying neurobiology of adolescence. The adolescent brain, like an *adolescent stream,* is functionally a work in progress. So just as it's not a good idea to build a house on the continually shifting bank of an *adolescent stream,* it's inappropriate to expect functional stability in a developing adolescent brain. Confusion rather than consistency may often more accurately describe adolescent cognition and behavior—but don't think of adolescent confusion or adult cultural confusion about adolescence as something pejorative. Just as it's okay for a six-month-old to be unable to talk and walk, it's also okay for an adolescent to be unable to effectively carry out functions that will eventually mature, and it's also okay for our culture to not yet know how best to nurture adolescents in an era of rapid cultural change.

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Although the cultural roles of children and adults are reasonably clear, we often send confusing and conflicting messages to adolescents about their expected cultural roles. We expect too little and too much. We expect adolescents to follow current cultural mores but to think for themselves. We deride their idealism as impractical but offer no successful alternatives to social issues. We finance their consumerism and then decry their wasteful behaviors. We laud virtuoso performance in adolescent sports and the arts, but we've reduced support for school physical education and arts programs. Adolescents are rapidly moving into adult body shapes, but we often (incorrectly) assume that their brain maturation is occurring at the same pace.

Our culture tends to have a confident sense of what's appropriate in the unequal adult/child and the egalitarian adult/adult relationships and responsibilities. We're less confident of what's appropriate in parental and parental surrogate/adolescent relationships and responsibilities. Let's briefly explore the cultural confusion that exists within adolescents and about adolescence as a prelude to a more extensive exploration of these issues in later chapters.

Confusion Within Adolescents

I have a very clear recollection of my first substantial adolescent thoughts about my adult life. I was walking home from school in the spring of my 14th year thinking about my fall entrance into high school when it suddenly occurred to me that work and not play would dominate my adult life. I would soon have to get a job and assume responsibility for my personal and family life. I recall deciding during that walk home that I had better begin to think seriously about my vocational direction and then figure out how to become successful at it. I also started to think about my personal values and life in ways that I hadn't earlier. I suspect that you had a somewhat similar epiphany at about the same age—and that today's mid-teens are continuing the tradition. Goodbye, childhood.

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We adults tend to think of early adolescence as a mindless developmental period, but I believe that most contemporary adolescents contemplate adult life as thoughtfully as we did. It's just that they typically don't share such thoughts with adults as much as they do with the peers who will accompany them into adult life. Peers listen to vocational and other dreams without giving practical advice, and thus encourage imaginative mental exploration during a confusing transitional period. You and I did the same thing.

During my 14th summer, I got a job in a greenhouse, which I kept all through high school—and it sparked my lifelong fascination with biology. The owner, Nick Schroeder, was a fine mentor who took the time to explain why we did the things with plants that we did. Not surprisingly, I subsequently majored in biology in college, and again a favorite biology professor, Carl Brandhorst, became my mentor when I became his lab assistant. I loved and respected my parents, but these two nonparental mentors made a major impact on my adolescent life and adult vocation. Working together at a potting bench and assembling materials for a lab class sparked the kind of informal conversations about a range of issues that were emerging in my life. I didn't agree with everything my mentors told me—just as I didn't agree with everything my parents told me—but I thought about what they said.

Several colleagues recently recounted the similar range and importance of such adolescent mentoring in their lives—from their teachers, coaches, youth directors, bosses, adult coworkers, neighbors, uncles and aunts, grandparents. I didn't realize until years later that my father had quietly encouraged and expedited my greenhouse job in the hope that I would benefit from the mentoring that he believed I would get from Nick, a man he respected. I hope that similar nonparental mentors emerged during your adolescent years and will also emerge in the adolescents in your life.

The dramatic biological changes that occur during adolescence are another element that typically shifts an adolescent's self-concept and self-esteem, and can thus cause confusion. One of our sons grew several inches in a few months and

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suddenly drew the unwelcome interest of the school's basketball coach. Menarche biologically transforms a girl into a woman within 24 hours. Acne, whiskers, breasts, voice changes, body hair, shifts in sleeping patterns, erections at inopportune times, and a whole lot more all require understanding and patience as adolescents gradually become comfortable with their inevitable body transformations. They simultaneously want and don't want the attention of others. They frequently look in the mirror but often don't like what they see.

As adolescents shift loyalties from family to peer relationships, they increasingly compare themselves with others. They may not consciously realize it, but in doing this, they're beginning what will become adult competitions and collaborations for mates and resources. They often believe that friends and others have their act together more than they do (and of course, the others feel that way about them). This typical feeling of inadequacy may actually be positive if it it's kept in perspective, since it can encourage the sense of striving toward personal and social identity that's necessary for an autonomous adult life. When such comparisons and competitions get out of hand, they can cause all kinds of personal and social problems. Like seasonings, a little bit can help—a lot can hurt.

Style thus becomes important to adolescents—in clothing, language, music, behavior, and other elements of their social selves. Children are willing to follow parental direction on such decisions, but adolescents often use them as initial exploratory steps in designing their own individuality. They push to see how far they can go before their parents object. Tattoos and body piercing provide a currently popular search for limits. Mass media provide positive and negative role models on what to do and how to do it for unsure early adolescents who want to express their individuality, but within the constraints of what they consider acceptable to their peers.

Adolescents' seemingly fickle taste sometimes drives their parents to distraction. For example, a recently much desired and still perfectly good pair of shoes or other piece of apparel is suddenly no longer in style. Your adolescent desperately needs a replacement—and believes that *a loving parent* would

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instantly provide the funds. Strange as it seems, the initial adolescent reach for adult identity and autonomy is thus often embodied in a need to imitate what others are thinking and doing—and *others* typically doesn't include their parents.

Confusion About Adolescents

Adolescent changes sometimes seem to occur dramatically. A stranger suddenly seems to have entered our life. I've noticed such dramatic changes in adolescent grandchildren I hadn't seen for several months—the interim disappearance of the *child* look, the shift from conventional to unconventional behavior, the late-adolescent examples of unexpected and welcome maturity. Conversely, the same changes may emerge gradually and thus imperceptibly in the mind of an adult who constantly interacts with the adolescent. It's therefore helpful to develop a record of childhood and adolescence in a manner that psychologically helps to place immediate (and perhaps unsettling) experiences into the context of a more gradual (and hopefully positive) 20-year development. Computerized digital technologies now simplify this process.

For example, videotape your children for several minutes on each of their birthdays. Ask them to tell what they've done during the past year and to display and discuss objects of current importance to them. The film will eventually become a marvelous, hour-long record of a child's entire 20-year physical and psychological development. It can provide developmental context to a currently troubled adolescent, and it's perhaps also something to reassure you late at night while awaiting your adolescent's return home.

A teacher can similarly take several pictures of classroom life each day and select and digitally store the one that best characterized that day. On the final day of the year, project the entire sequence of pictures on a screen—a 45-minute roller-coaster ride through the school year that shows the class where they were at the beginning, what they've done during the school year, and what they've become at the end.

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Adolescents are increasingly creating personal Web logs, or "blogs"—Internet diaries of their experiences and commentaries on their beliefs that they share electronically with friends. A blog is something like a computerized mirror that reflects a verbal picture of the blogger. And as with a diary, it's possible for adolescent bloggers to reread what they wrote months earlier—but also to compare their experiences with those of other adolescent bloggers. And being adolescents, they may also post things on the Internet that they wish they hadn't when they reach adult life and decide to run for public office.

Traditional beliefs about adolescence and artfully edited memories of our own adolescence cause some of our cultural confusion about adolescence. I'm sure that you quickly (and correctly) determined that my stories of a sudden 14-year-old realization of the reality of adult life and my subsequent after-school greenhouse job didn't tell the entire story of my adolescence. Adults are often caught between trying to recapture and recast the idyllic adolescence they now believe they had and shielding their own adolescents from any of their negative adolescent experiences.

My childhood occurred during the Great Depression of the 1930s, and most of my adolescence occurred during World War II. These were terribly distressing, historically significant periods, but many children today experience an analogous family financial devastation that occurs when seemingly secure parental jobs disappear—and war and the threat of terrorism seem a continuing reality. When generations compare their experiences, the old adage that the more things change, the more they remain the same holds true. Folks may like to think that they lived their early years in a more difficult time than their children and grandchildren, and that they behaved more appropriately—but I've lived long enough to doubt most of that rhetoric. Good and bad times and good and bad behavior are experienced individually and can occur anywhere and at any time. But having suggested that, it's also important to consider the problems our society currently confronts that make contemporary adolescence problematic in ways that differ significantly from earlier generations.

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