

THE DEVELOPING BRAIN AND SEX

THE BRAIN CAN BE MOLDED POSITIVELY
by structure and guidance.
It can also be molded negatively by
poor input.

What is certain is that the brain will be
molded by one or the other.

"I wish I had said no. I
wish I had been strong
enough, and I wish my
parents had helped me
more. I had no idea that
having sex would change
my life so much."

—Karen, 20

We've already gotten a glimpse of how the three-pound human brain is the most complex mass of matter in the universe. But just how does the brain develop? Can anything influence brain development for better or for worse? And how does the topic of sex fit into this discussion?

We're all familiar with the external signs of physical growth as a person goes from babyhood through childhood and adolescence: loose teeth, shoes that don't fit anymore, clumsiness, and a voracious appetite, just to name a few. But how does the growth process affect the brain? After all, just as the rest of the body does, the human brain itself grows and develops from birth to adulthood. The maturation of the brain is in many ways more delicate, more unpredictable, more important, and until recently, less understood than that of any other part of the body.

For many parents of adolescents, the phenomenon of the developing brain can be summarized in a single question:

“Why in the world does my teenager act this way?” Historically, the scientific community was not able to respond to that question very well. In the past, most of the techniques for studying the adolescent brain were invasive or potentially damaging. Therefore, little was known about the activity going on inside a young person’s brain.¹

“I want to protect my kids.

I would never want them to go through what I did, and have to live with the guilt and regret. I wouldn't wish it on anybody, least of all them.”

—Mark, 36

Inside the adolescent brain

Only during the past few years have scientists been able to use new technologies such as MRI (Magnetic Resonance Imaging), fMRI (functional MRI), and PET (positron emission tomography scans) to study the brain in groundbreaking new ways.

The technology called *MRI*, which relies on magnets instead of X-rays, has revealed amazing new information about adolescent brain activity. Since magnets do not hurt living tissue and therefore can be used over and over, this technology can be used to observe adolescent brains as they grow and develop.

A *functional MRI* uses similar technology to observe how much oxygen a given portion of the brain is using. When an area of the brain is “working,” it must have oxygen to fuel that work. That increased oxygen consumption is measured by functional MRI, revealing new data about what is happening in the brain.

A *PET scan* is a medical imaging technique that produces a three-dimensional image or map of the brain by measuring the flow of blood to any given area. When an area of the brain is active, there is more blood flow, and the PET scanner can “see” that. For example, one fascinating

finding reports that the brain center for “lust” is different than the brain center for “love.” Knowledge of this phenomenon is made possible by PET scans and other new techniques.²

Primarily with the aid of MRI, scientists have made an important discovery about the brain’s growth and maturation. The part of the brain that controls the ability to make fully mature judgment decisions is not physically mature until an individual reaches his mid-twenties. In other words, the part of a brain that is responsible for complex assessments about future consequences and responsibility is still growing throughout the teen years and into the mid-twenties.³

Most of us give little thought to where our decision-making ability comes from. To many, it seems to be an extension of our personalities and opinions. Simply put, we rarely think about *how* we think. Through studies of individuals who have either experienced brain trauma or undergone surgery on different portions of their brain, neuroscientists have known for years that our capacity for cognitive thought comes primarily from what is called the prefrontal cortex of the brain’s frontal lobes.⁴ It is located at the front of the brain, behind the forehead.

This area is the source of thought that is responsible for setting priorities, organizing plans and ideas, forming strategies, controlling impulses, and allocating attention.⁵ This type of thinking is “cognitive,” which also includes initiating appropriate and moral behavior, anticipating how behavior today can affect one’s future, and sound judgment decisions. The adolescent years are critical for developing these functions. While young people can make some good judgment calls for themselves, it is impossible for them to make fully mature judgment decisions until their mid-twenties, when

their brains are finally mature.⁶

One of the best and most understandable evidences of this observation is that car rental companies will not rent their cars to a person under the age of twenty-five unless special arrangements have been made or a higher rate is charged. The reason given by these companies is that the risk of damage and destruction of their property is excessive when driven by younger drivers, regardless of education or employment.

The finding, therefore, that cognitive maturity does not reach completion until the mid-twenties does not mean that young people are somehow physically slow or that they do not possess the capacity for complex thought. It does mean that their brains are not fully physically equipped to make sound judgments and reason through long-term consequences of behavior they might become involved in until a little later in life. When people first hear this information they often take it to mean that young people are inherently less intelligent than adults. This is a misinterpretation— young people can be extremely intelligent. For example, Mozart completed many compositions before the age of fourteen; Picasso painted the *Picador* at age eight; there are many other examples of people demonstrating intelligence and giftedness at a young age. Also, it does not mean that young people are not otherwise physically mature. LeBron James went directly from high school basketball to the NBA at the age of nineteen, a more physically gifted basketball player than many who were years older and far more experienced.

The ability to make sound judgments, then, does not depend on one's intelligence.

What we now know about development of this part of the brain—the prefrontal cortex—is that during the explo-

sive period of adolescent brain development, synapses (the connections that bridge the gaps between neurons) play an integral part in forming the mature brain. Research has shown that there are two periods in one's life during which there is an explosive proliferation of connections between brain cells—during the last few weeks before birth and just before puberty. The brain manufactures far more of these connections (synapses) than are necessary. The interesting thing we now know about this excess of synapses is that some are meant to be strengthened and some are meant to die. It just depends on what we experience.⁷ As we have already seen, synapses that strengthen and proliferate are those that are used (think of “use them or lose them”). The synapses that are not used weaken or die.⁸

Setting the course

Adolescent brains can be positively molded by structure, guidance, and discipline provided by caring parents and other adults. This may include any number of positive inputs including loving, caring guidance, discipline (sometimes unpleasant but not dangerous), and also behavior in which the teen is required to take a chance because the outcome is unpredictable: trying out for the high school football team, learning to drive, going to college. These all carry certain emotional or even physical risks, but are necessary in order for the young person to separate from parents and grow into an individual.

“I’ve seen the changes in
some of my friends. I’ve
seen them cry and feel
bad and lose hope that
they will ever be loved. I
haven’t found the love of
my life yet either, but I am
so glad I don’t have the
baggage they do.”

— Cheryl, 26

Adolescent brains can also be negatively molded by unstructured experiences or bad input such as neglect, poor guidance, poor structure, or lack of discipline. For these unfortunate youth, this means that the guidance they receive and experiences they have come from the media, pop culture, or peers who are as neglected, immature, and poorly guided as they are.

What is certain is that the adolescent brain will be molded by one or the other.⁹

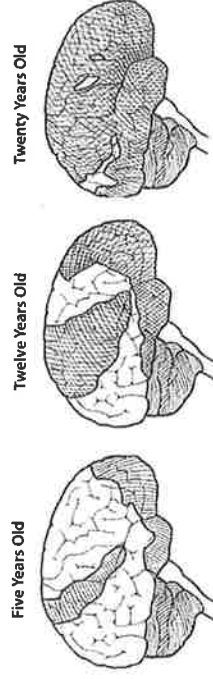
The point here is that if young people are not guided by parents, mentors, and other caring adults, but make their own decisions based on these less than optimal types of bonding, they often make poor decisions.¹⁰ As we explained in chapter 2, this information has many implications. One implication is that, as we have shown, young people can develop early bonding to someone they find attractive. If they feel that “this is the one for them,” they can enter into progressive physical contact with that person until they have had sexual intercourse and are then even more closely bonded to the person and “addicted” to having sex.¹¹ Research has shown that these relationships eventually break apart far more often than they succeed.¹²

An obvious question is that if skin-to-skin or sexual contact causes such bonding, why don’t more of these young couples stay together? And the truth is that a few do. We all know examples of very young couples who become pregnant, get married, and stay married for many years.

We also know teenagers who become attached to each other and the relationship drags on for months or even years in spite of one person abusing, cheating on, or degrading the other.

But for the vast majority, these relationships begun while the couple is young and unmarried are short-lived.

The chance of the bonding growing tighter and more permanent, resulting in a lifelong commitment is not realized. These breakups are due to any number of reasons, including attraction to another person, boredom with the current partner, a family move, opinions of peers, the distraction of other activities, even parental disapproval, among countless others. But in spite of the brevity of these sexual encounters, research indicates that bonding does occur, even when a couple has only engaged in sex a single time.¹³



The prefrontal cortex of the brain is not mature until a person grows out of adolescence and into their mid-twenties. Shaded portions represent the growing complexity and sophistication of the brain from age five to age twenty. This development is a key factor in an individual’s ability to make mature judgment decisions.

Further, there is evidence that when this sex/bonding/breaking-up cycle is repeated a few or many times—even when the bonding was short-lived—damage is done to the important, built-in ability to develop significant and meaningful connection to other human beings.¹⁴

Another negative consequence is that as young people experience these sexual relationships it affects their brains, molding them not only to damage their attachment ability but to become desensitized to the risk of short-term sexual

relationships, eventually believing that this behavior is harmless and acceptable, and does not involve the psychological and mental health part of themselves.¹⁵ In contrast, the relationship that continues long-term experiences a bonding that, in a sense, glues the two people together for life. This bonding, as we have examined, is due in part to the oxytocin and vasopressin secreted into the woman's and man's brains as a result of their contact with each other. This is the deep, abiding love of a mature relationship.¹⁶ One long-term result of the mature love relationship that stays intact (and there are many such positive results, such as providing a stable home environment for child security) is a relaxed, trusting, loving, rewarding, faithful, sexual relationship.¹⁷

The healthy progression of relationship strengthens the brain cell connections associated with "attachment" of one person to another, helping to ensure the permanence of the relationship that finds its healthiest expression with sexual consummation in marriage.¹⁸

But this natural process can be short-circuited. During the intense early romantic period a couple wants to be together. This togetherness can obviously include physical closeness. The physical closeness will normally produce sexual interest. If individuals in this early phase of their relationship spend time with intimate skin-to-skin closeness and then become sexually involved, it will activate the oxytocin and vasopressin-induced bonding.¹⁹ Since this bonding has taken place before consideration of issues that could be divisive has occurred, the couple may break up when these very practical considerations intrude, as they always will. Then the breaking of the bond happens, with pain sometimes felt like physical pain, and the regrets occur.²⁰

However, when a short-term relationship breaks up—

and certainly when a relationship that is an early intense romantic relationship breaks up—it is felt in the same brain centers that feel physical pain and can actually be seen on brain scans.²¹ Like any other powerful experience, an intense romantic relationship molds the mind.

The bonding process can also be short-circuited by a couple progressing immediately to sex. People involved in this behavior either don't think about the risk or believe they can disconnect their sexual involvement from the rest of who they are. We have shown that this is impossible. Thus, unconscious damage also occurs because it violates the integrity of personhood, because anything we do involves the whole person, even if we don't realize it.²²

Finally, the finding that the brain centers that produce feelings of romance and love are different and separate from the brain centers responsible for lust is a huge warning to adolescents and young adults. A selfish and manipulative person may have an intense desire to have sex with another person. To accomplish that goal, they may lie about being in love. It is important to know the desire someone has for sex can exist without any feelings of caring, love, or romance.²³ This is something that takes some life experience to recognize, which is why even young adults still need guidance.

All this adds up to show that if adults merely provide adolescents with facts about behavior, but don't give them guidance on how to act on this information, teens and young adults cannot make the very best decisions and often will make poor decisions. It is crucial that parents and other influential adults provide adolescents with the guidance to make the best decisions based on the facts that have been presented.

Adolescent judgment, therefore, is in gradual formation and will only achieve true maturity when shepherded by

the guidance of parents or committed and caring mentors. As children grow older, the need for adult guidance naturally decreases, and yet continued adult guidance is needed for longer than most of society has realized in past years. The need for advice and supervision extends through the college-age years and for two or three years after.

In addition, the guidance of parents and other caring adults can help structurally develop the brain of a young person, thus enabling her to make the very best decisions by the time she is fully cognitively mature. This guidance allows her to have the best chance of becoming who she is meant to be, the best chance of fulfilling her dreams.²⁴

Responsible parents, and those who support them, can help adolescents and young adults avoid risky behavior that can damage them permanently. In fact, recent surveys of college students show that parents influence the decisions they make about sex more than even their friends do.²⁵

The Connection Inspection

While the brain and body need to develop to reach their full potential, humans are also born with certain traits built in from birth. These inborn characteristics are sometimes referred to as instinct, and include things such as the ability to understand meaning through facial expressions, or the ability to acquire language. A critical human trait, one that has enormous implications for sex and relationships, is the need to connect to other human beings.²⁶

"We kept having sex even though I knew he was seeing other people. I just needed to be with him, I needed him to hold me. We even did it in his car. It was humiliating, but I didn't know what else to do."

—Samantha, 20

It is a scientifically validated finding that emotionally healthy humans connect to each other. It is felt in the strangest ways. Have you ever wondered why, when another person yawns, you often do too? Have you ever thought about why you feel the pain of someone you love when they are experiencing devastating problems in their lives? Have you wondered why you can almost predict what someone else is going to say before they say it? These and other thoughts, feelings, and actions are evidence of the "connectedness" that is a common, necessary, and normal aspect of human nature. Without this connectedness we would not only be emotionally but physically less healthy. This connectedness comes directly from the way our brains are formed and function from even before birth.

For example, if babies are given adequate nutrition and health care, but are otherwise left in their cribs untouched, they usually do not thrive and can even die.²⁷ This connectedness is not only something that exists in us as human beings but is there for a purpose—it contributes to our being fully human and to our being able to accomplish those things we are capable of and want to succeed at, not just physically but emotionally, psychologically, relationally, and so on. And as we shall see, it is the very first step in building healthy, meaningful relationships that are vital for a truly fulfilled life.²⁸

The human brain is formed so that at birth it demands "connecting" to other human beings. Here is how Allan N. Schore of the UCLA School of Medicine puts it: "We are born to form attachments . . . our brains are physically wired to develop in tandem with another's, through emotional communication, beginning before words are spoken."²⁹

Italian neuroscientist Giacomo Rizzolatti discovered a certain kind of brain cells, "mirror neurons," that help

explain aspects of our connectedness to others. These neurons are responsible for allowing us to feel a loved one's pain, or experience hunger when we hear someone bite into an apple. Mirror neurons also appear to be essential to the way children learn.³⁰

In addition, psychologist Daniel Goleman explains that "imitative learning has long been recognized as a major avenue of childhood development. But findings about mirror neurons explain how children can gain mastery simply from watching. As they watch, they are etching in their own brains a repertoire for emotion, for behavior, and for how the world works."³¹

This process is critical from birth, when babies bond and learn from their mothers, all the way throughout childhood and adolescence. It serves as further proof that humans are profoundly social beings, who possess an inborn need to connect and bond with others.³²

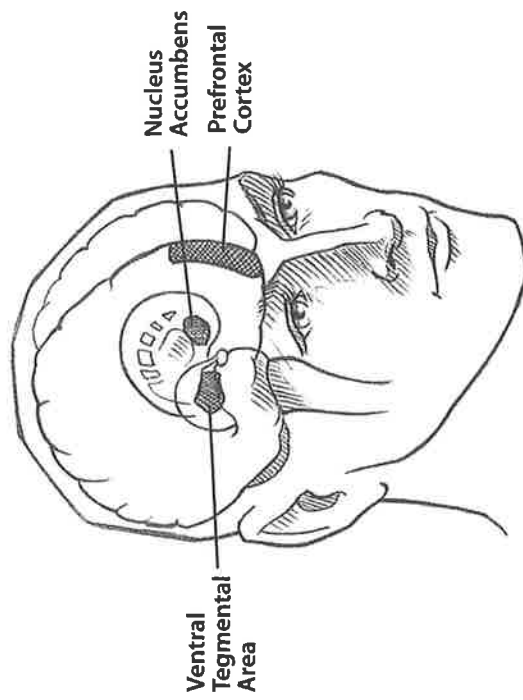
Connectedness, for the average, healthy person, is a part of who we are and how we function. It is wired into our brains when we are still in our mother's womb. This connectedness is passed on by our genes and is necessary for us to survive and thrive as healthy, capable persons. If we have mothers who are highly nurturing, we develop better connectedness and we ourselves are more likely to nurture our own children better and help them connect better with others.³³

"She wanted to do it—
I didn't push her or anything. But when it was over she cried and acted like it was a big mistake. I wish it hadn't happened. But we can't take it back and now everything is messed up."

—Andy, 15

The sex connection

It is probably obvious by now what the natural and healthy inclination for connectedness has to do with sex. Studies show that the primary desire of adolescent girls in romantic relationships is intimacy. When a survey published in *Seventeen* magazine queried thousands of teen readers on sexual issues, fully 40 percent of participating teens reported that they had assured a potential love interest that they would consent to just a "hook-up" when what they really wanted was a relationship.³⁴ In short, sex is an intense experience of connectedness. As we have noted, when people have sex, the act triggers the release of dopamine in their brains, thus rewarding them for engaging in such an exciting and pleasurable act.



Brain areas most commonly involved in mature or long-lasting and committed love.

As we've discussed, oxytocin is released in the female as this behavior persists, bonding her to her sexual partner and creating a greater desire to repeat the activity with him. When a male engages in sex, vasopressin is released, bonding him to his partner and also stimulating the desire for more sex. Most important, the synapses that govern decisions about sex in both the male and female brains are strengthened in ways that make it easier to choose to have sex in the future, while synapses that govern sexual restraint are weakened and deteriorate. In short, engaging in sex creates a chain reaction of brain activities that lead to the desire for more sex and greater levels of attachment between two people.

It may sound blunt, but if we try to eliminate this connectedness from sex, we remove the uniquely human aspect of it, and the sexual act becomes nothing more than raw animal behavior. However, when this connectedness is allowed to mature in the context of a lifelong committed relationship, sex is a wonderful, sustaining expression of love.

Obviously, individuals do not carry the connectedness they have in infancy directly into adulthood, knowing exactly which person to connect with in a lifelong, mutually faithful monogamous relationship. There are some interim steps, as even a cursory observation will note. However, there are stages of emotional development leading to that point:

- *Infatuation or nascent love*: this is the emergence of interest in the opposite sex during adolescence. An adolescent may have very emotional and strongly felt "love" for one individual and a few months later, a similar strong feeling for another person.³⁵

At this point, several divergent paths emerge. This is a critical juncture, where most people choose to engage in one of the following patterns of behavior:

- *Short-term sexual relationships*: these are sexual relationships that have very little connectedness and, according to extensive research, the least satisfying sex. The normal connecting and bonding seems to become damaged by such relationships, often leading to a pattern of serial sex that can last for years.³⁶
- *Long-term monogamy outside of marriage*: a sexual relationship that usually results in weaker connectedness, less permanent relationships, sex with somewhat less satisfaction and bonding.³⁷
- *Love*: this is the real thing and causes a couple to view each other as potential lifelong mates (or at least long-term mates). This emotion often occurs in young adulthood after the cognitive development of adolescence is largely completed. Though this relationship may not invariably lead to marriage, it often does.³⁸
- *Marriage*: this is the sexual relationship in which connectedness is found to be the most long-lasting and strong and the relationship associated with sex in which the greatest satisfaction, bonding, and healthy sexual addiction is found.³⁹

Love? or infatuation?

What can we possibly learn from neuroscience about something so indefinable and personal as love? As it turns out, we can learn a lot. What we learn can help us understand our own feelings and can also help us give guidance to our young people as they deal with the powerful emo-

"I feel like I can't trust anyone anymore. I thought he cared for me, but now I wonder if it was just all about sex for him. I don't really know how to know the difference."

—Chandra, 16

tion they often call love. But is it really?

Infatuation refers to the incredibly exciting awakening of sexual awareness embodied in focus on a person of the opposite sex. However, infatuation does not befall just preteens and young teens. It can "hit" anyone of any age. We call infatuation the great imitator of true love because it appears that the same brain centers that signal "passionate new love" to an individual are the ones that cause a more immature feeling, that of "infatuation." It is therefore impossible from brain study techniques as well as by social study techniques to say whether the feelings one has for another person constitute infatuation or legitimate early love.⁴⁰

Since not even a study of the brain can tell the difference between true love and infatuation, parents as well as young people themselves should be cautious when an adolescent pronounces himself "in love." This feeling of love can be very intense, similar to obsessive-compulsive disorder, causing people to think of doing things they would not ordinarily do.⁴¹ This intense emotional state may last several months. (There is no specific cutoff time found by scientists.) This cutoff is not sudden and may in part be due to a gradual decline in the level of dopamine.⁴²

Many couples break up during this time for any number of reasons, such as other priorities (education or job), lack of common interests, personality problems, disagreements over goals, religion, and so on. Some of the reasons people break up are difficult to define. They might be included

under the term *intuition*. One or the other or both "just know" the relationship, as intense and exciting as it is, is not right in the long run.⁴³

Having this information at hand, it is easy to see the advantages of patiently letting a relationship mature before committing to it through sexual involvement. Letting a relationship mature means taking time. Even though brain scans cannot tell whether initial infatuation will become true love or not, they can show the difference between the early passionate stage of romantic love and that of long-term, comfortable, and relaxed, loving attachment.⁴⁴

One reason it is best to not become involved sexually before marriage is that statistics say that a relationship started prior to the age of twenty-one will probably not be permanent. As any adult can attest, infatuation is usually short-lived, lasting only weeks or months and not years as does true love. Statistics show that if young people begin having sex when they are sixteen years old, more than 44 percent of them will have had five or more sexual partners by the time they are in their twenties. If they are older than twenty when they initiate sex, only 15 percent will have had more than five sexual partners, while just over 50 percent will have committed sexually to only one partner.⁴⁵

If people of any age become sexually involved before marriage, the intensity of the desire for repetition of sexual activity can overwhelm everything else in the relationship. Sex at this immature stage can keep a person from honestly

It is easy to see the advantages of patiently letting a relationship mature before committing to it through sexual involvement.

evaluating the other person. Sex can make a person feel that the other person is the "right one" because the bonding and dopamine high it brings can blind one to honestly looking at the other's faults and lack of compatibility.⁴⁶

Hooked on love

"We're proud of it. We set a goal to be pure for each other on our wedding day and we did it. It wasn't easy, but it taught us a lot about each other. I'm glad we did it."

—David, 30

We have seen how experience produces brain molding, both in positive and in negative manners. This process is also powerfully at work in sustained romantic relationships. As these intense and exciting relationships develop, they cause connections between brain cells to grow stronger and more numerous. As we know, when those connections grow and cause more pleasurable behavioral experiences, more dopamine is released. This abundant outpouring of dopamine is similar to what happens in other more commonly recognized forms of addiction such as substance abuse. "Drugs such as cocaine and amphetamine target dopamine neurons."⁴⁷

In other words, love, on a biochemical level, is a lot like addiction. The healthy addiction of a lifelong monogamous sexual relationship even has measurable physical benefits. Consider what these researchers found:

Janice K. Kiecolt-Glaser and her colleagues at the Ohio State University Medical Center conducted a series of studies examining the connections between close sexual relationships, especially those of married couples, and physiological processes such as immune, endocrine, and cardiovascular functioning. These re-

searchers report growing evidence linking relationship intimacy to better health, including stronger immune systems and physical wounds taking less time to heal. Conversely, high-conflict (anti-intimate) marital relationships appear to weaken the immune system and increase vulnerability to disease, especially among women, including worsening the body's response to proven vaccines and lengthening the amount of time required for physical wounds to heal.⁴⁸

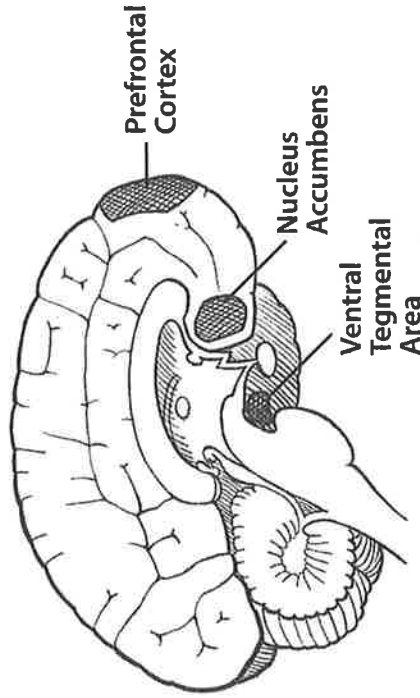
In short, brain researchers and other scientists are now clearly mapping out what might be called the biochemistry of connection.⁴⁹

Other research has revealed numerous benefits of individuals maintaining long-term connectedness to their mate. James Coan, in a study titled "Lending a Hand: Social Regulation of the Neural Response to Threat" gave a mild electrical shock to married individuals. If they were holding the hands of their mate, their ability to handle the shock was much better than if sitting apart. While the physical contact made no difference in the way it felt to be shocked, individuals being comforted by their spouse were reassured and calmed.⁵⁰ This is just a small example of how connectedness with a spouse is even found to be associated with better health.

Love, Romance, and . . . Lust?

One of the most startling findings of all in this brain research about love and lust is that they are each handled distinctly differently by the brain. Recent studies⁵¹ showed certain brain centers to light up in subjects as a result of being shown pictures of their beloved. These patterns of

brain activity were distinctly different from the brain activity associated with lust as shown by other experiments.⁵²



Side view of brain areas most commonly involved in mature love.

This means of course that a man (or woman) can be sexually attracted to another person, approach that person for sex, engage in sex, and yet have no sincerely love-motivated thought or interest at all because all their desire arises from the brain's center for "lust." Young men and women especially need to be aware of and alert to their own feelings and to those of a potential partner. A person might approach another with a show of warmth and consideration, acts of kindness, even with words of love and commitment. But all this can be based on lust—a counterfeit emotion designed to manipulate the other into having sex, with no romantic or love interest at all.

While it is normal and not wrong for a human being to have lustful sexual urges—and lust in the context of a loving married relationship is certainly normal—it is the acting on lustful urges alone that is out of sync with human

nature. This is critical to understand if we are to be emotionally healthy, and an understanding that is necessary for a future that is as free of problems as possible. To practice sex out of sync is to ignore the fact that healthy human behavior demands the integration of all of what we are—body, mind, emotions, and spirit.⁵³

Sex practiced inappropriately can both control and damage the relationship. As one writer puts it, a nonmarital "relationship is only as old as it is nonsexual. The relationship stops growing once it becomes sexual, because the erotic aspect will become the primary focus of [the couple's] time together."⁵⁴ Not only is such a relationship damaged, but the two people involved can also be.

On the other hand, in a relationship of true love and long-term commitment, sex takes its appropriate place—not at the center of the relationship, but as one of the natural outcomes of the healthy connectedness of two people. Sex will then be a catalyst to the full, healthy, long-term committed relationship it strengthens.

These are the things that define us as human. True "love" includes applying this mature thought process to another in the context of romance, attachment, and bonding. Allowing such love to develop and then to guide us will lead to healthy and good decisions about behavior. Such decisions will then expand our horizons, help eliminate baggage that might weigh us down, and send us into true, life-f fulfilling love.