Many astute observers have given detailed descriptions of child development, particularly mental and verbal abilities. The last few years has produced a new level of observation. Several types of brain scans can now study actual brain activity and discover when and how the brain itself develops. Certain surgical studies have even studied individual brain cells--discovering such quaint things as brain cells that recognize and respond to facial expressions. Three theoreticians have strongly influenced my knowledge of the link between brain development and the growth of an identity.

Dr. Allan Schore from the UCLA School of Medicine has carefully described the many studies on development of the infant brain as it relates to the development of IDENTITY. Dr. Schore has written some of the best technical descriptions of current research on brain changes during the development of maturity. Dr. Schore has combined the theories and discoveries of neuroscience, development, attachment, and psychoanalysis (Lott 1998) in order to make sense of very complex and separate fields.

In particular, he has studied the development of the orbital prefrontal cortex. This is the part of the brain that is at the top of the command hierarchy and is connected to every major system in the body. It is the first part of the cortex to receive information from inside the body or outside as well. Dr. Schore's work is notable in describing how this part of the brain (which I have called the "joyful identity control center") develops and works.

Dr. Daniel J. Siegel from UCLA is the medical director of their infant and preschool service. He has contributed greatly to understanding children's memory, the brain and dissociation. He has studied Shore's work and so the two scholars form a fairly unified point of reference. Dr. Siegel has made sense of attachment research, information processing systems in the brain, memory, trauma and clinical issues related to trauma.

Dr. Bessel van der Kolk from Boston University School of Medicine and Harvard University has done in-depth study in the area of trauma and deprivation. Dr. van der Kolk has written summaries of early bonding research and added his own studies on the effects of early traumas at different ages. From this work we can see the tremendous deficits caused by early psychological injuries and deprivations. He details the neurotransmitter, immune system, biochemical, developmental and social impacts of early deprivation, loss and trauma. He points out that there are critical periods for attachment and brain growth, that early trauma results in a life-long inability to regulate affect (emotion,) and describes the major neurochemical imbalances and deficits resulting from early deprivation.
Schore, Siegel, and van der Kolk have organized the many neurobiological and biochemical studies that relate to attachment and bonding and described what can go wrong. Their material has formed the basis for what I have written on the infant brain development. I have tried to convey these ideas in common English and in word pictures. The result may be clearer but less precise. Any errors or misrepresentation of their work are purely mine.

The LIFE Model The theory behind this paper is based on the LIFE Model of Redemption and Maturity developed at Shepherd's House Inc. in Van Nuys California. Pastors, counselors, prayer team members, lay leaders, and an international advisory panel from many traditions and theoretical perspectives worked together to formulate and record this profoundly Christian view of life. Copies of the LIFE Model can be obtained from:

Shepherd's House Inc. www.lifemodel.og

For those who are unfamiliar with the LIFE Model, here are some of the basic tenets. The LIFE Model is a way of life designed to restore our identities as individuals, families and communities so that we live from the heart that Jesus gives us.

Areas of Responsibility:
• God is responsible for redemption
• Humans are responsible for maturity

When these two areas of responsibility are correctly maintained, we develop into our true identities as individuals, families and communities. These true identities are found in the "hearts that Jesus gives us." Without discerning God and ourselves through these hearts, we fail to act like ourselves and miss the mark—we sin. Without our own efforts and community guidance, we remain immature.

Failure to Develop Our True Identity and Act like Ourselves:
• Sin is caused by the sark (sarx)
• Immaturity is caused by trauma
  ◆ Type A trauma is the Absence of necessary good things
  ◆ Type B trauma is the Bad things that happen

Some Aspects of Maturity:
• Maturity develops based on bonds
  ◆ Healthy bonds are based on joy - someone loves me
  ◆ Sinful bonds are based on fear
• Maturity develops in stages
  ◆ Prenatal - grows a working body
  ◆ Infant - grows a working identity through receiving
  ◆ Child - learns to take care of self
  ◆ Adult - learns to care for two or more at once
  ◆ Parent - grows children by giving sacrificially
  ◆ Elder - grows a community
• Maturity requires individual and community effort
• As dependent creatures we must receive before we can give

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1Dr. Dallas Willard's term. He is a theologian, scholar, and professor of philosophy at the University of Southern California.
• To live and mature we must both receive and give
Humans have been given dominion over their individual and community maturity by the creation order. Inherent
in this dominion is the capacity, as a people, to understand and accomplish maturation. That is, we can know how
people "grow up" and how to bring about this growth.

Some Aspects of God's Redemptive Work:
• Regeneration - We receive a new heart
• Healing - We are healed of the traumas of sin
• Spiritual Adoption - We receive a spiritual family
• Deliverance - The assaults of evil on us are stopped
• Spiritual Gifts - We receive the means to participate in God's redemptive work

God's redemptive work is one of restoration. Spiritual adoption is the aspect of redemption tied most closely to the
normal human task of maturity. Spiritual family is God's provision to heal type A traumas caused by the absence
of loving bonds in our lives.

Bonding (Schore) Infant bonding is guided by the infant's attraction to joy and excitement. The preferred source
of this sensory input changes as different regions of the brain myelinate. The primary bonding modalities for the
first two years are:

Summary of Bonding Development and the Senses (Schore)

<table>
<thead>
<tr>
<th>Period</th>
<th>Senses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1.5 months</td>
<td>Taste, smell and temperature</td>
</tr>
<tr>
<td>1.5 - 3 months</td>
<td>Touch</td>
</tr>
<tr>
<td>3 - 12 months</td>
<td>Visual (facial expressions of emotion)</td>
</tr>
<tr>
<td>12 - 24 months</td>
<td>Auditory (voice tone)</td>
</tr>
</tbody>
</table>

Attachments are formed during periods that correspond to major growth in the right hemisphere. The amount of
growth experienced is directly linked to psycho-social stimulation. Joyful interactions stimulate growth while
stressful events leave deficits.

Periods of Right Hemisphere Growth (Schore)

<table>
<thead>
<tr>
<th>AGE</th>
<th>STAGE</th>
<th>MAIN OBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18 months</td>
<td>Early infant</td>
<td>Mother</td>
</tr>
<tr>
<td>3-5 years</td>
<td>Early child</td>
<td>Father</td>
</tr>
<tr>
<td>7-10 years</td>
<td>Late child</td>
<td>Friends</td>
</tr>
<tr>
<td>15 years</td>
<td>Early adult</td>
<td>Mate</td>
</tr>
<tr>
<td>First child</td>
<td>Early parent</td>
<td>Baby</td>
</tr>
</tbody>
</table>

The periods of right hemisphere growth are important as they constitute the best times for bonding as well as for
forming new identities. This observation is based on the right hemisphere's dominance for emotions, relationships
and bonding. This is also where the most remediation can be done for existing bonding deficits. The time to
improve bonding, self control, emotional expression and correct relational problems is during right hemisphere
growth. During these times the right hemisphere may be more open to new experiences.

The Early Developmental Milestones (Schore)
• The "theory of self" region in the right cortex matures at 6 months. (Siegel)
• The "joyful identity" in the right orbital prefrontal cortex grows between 6-12 months.
• The "return to joy" from negative feelings is learned between 12-18 months.
• The limbic system myelinates at 15 months.
• The prefrontal cortex attempts to grow a "joy ring" to unify the emotional centers of the limbic system
into one coherent identity at 18 months.
Integration of emotional identity functions are learned between 18-24 months (Become one person with all feelings.)

The mind's memory "library" (hippocampus) myelinates between 2-3 years.

The corpus callosum completes growth at age 3

- Child has essentially a "split brain" until 3
- No management of right hemispheric affect through words is possible before age three
- Right and left hemisphere memories are separate to age 3 (no story line for feelings)

Cortical consolidation of permanent memory begins at age 8 during REM sleep--the process takes days to months. (Siegel)

**Information Processing in the Brain** (Siegel, Schore) Information is first received and processed by Central Receiving (thalamus) which notifies right hemispheric memory and sends the input to the Guard Shack (amygdala) to check for danger. The Guard Shack can take three actions before sending on information: 1) Armed response (sympathetic activation,) 2) Disaster shutdown (parasympathetic activation,) 3) Call Fire Department (cortisol via ACTH.) All three actions are mediated by the hypothalamus. From the Guard Shack, information goes to the Library (hippocampus) to check against other sensory memories on file. Once identified, the sensory information and associated memories are given to the Head Librarian (anterior cingulate) who integrates cognitive and affective components. The next stop is the Identity Center in the prefrontal cortex where "we" begin to think consciously.

**Memory and Memory Retrieval** (Taken from The Red Dragon Cast Down) Because the brain's "library" called the hippocampus doesn't develop sufficiently until children are two or three years old, everyone has "infantile amnesia" until then. During this time we have the best look at two different memory systems described by Siegel.

**Right and Left Hemisphere Memory Systems.** We still learn a great deal before age three and much of that is stored in right hemispheric memory which is not controlled by the hippocampus. This memory system in the brain is called implicit memory. (Siegel 1996)

- Right hemisphere memory is NOT mediated by the hippocampus. It is:
  - implicit
  - non-focal
  - not suggestible at all (no one can implant ideas)
  - has no subjective sense of being recalled (remembered)

What we usually call memory has a subjective sense of being recalled. We can tell we are remembering. We know this is a story or event and it is in the past. This kind of memory is the explicit left hemispheric memory that is controlled by the librarian--hippocampus.

- Left hemispheric memory is:
  - explicit
  - focal
  - conscious
  - very suggestible (one can implant ideas)
  - has a subjective sense of being recalled
  - autobiographical with sense of space and time
  - cortically consolidated during REM sleep (after age 8)

Just as you cannot explicitly remember your birth because your librarian was not developed enough to create a left hemispheric story of the event, you will also not have left hemispheric memory of anything that happens when the librarian is asleep, unconscious, drugged, or overloaded. Three things can overload the librarian.

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2 Daniel J. Siegel, lecture in the continuing education seminar "Understanding and Treating Trauma: Developmental and Neurobiological Approaches," at the University of California, Los Angeles, February 1, 1998.
any of these happen we call our lack of explicit memory amnesia.

- The hippocampus is blocked by three conditions:
  - massive discharges by the amygdala (alarm centers of the brain)
  - split attention
  - high levels of cortisol (stress hormone in the blood)

Cortisol secretion is caused by prolonged stress. Repeated or prolonged trauma stimulate cortisol secretion. Cortisol destroys new nerve connections thus "unlearning" or "unremembering" whatever led to the stress. Thus high cortisol levels can also cause us to slowly forget (over a period of days) many details of newly learned explicit memory. When the brain is young and still developing (particularly before three years of age) this also destroys whatever part of the brain is new growth. Thus high levels of cortisol during development of any brain system will leave a permanent lesion in that brain structure. (i.e. trauma between 2-3 of age will leave a "scar" in the hippocampus which is developing at that time. (Lott) It will not work right after that.)

Because right hemispheric memory does not use the librarian it is possible to have right hemisphere memory for events which have no left hemisphere counterpart. The right hemisphere carefully records all events that overwhelm the hippocampus librarian. In right hemispheric memory, events are not associated with thoughts and words so they cannot be retrieved by thoughts, words and questions. The information is in the mind but not retrievable by thinking about it. The story can't be spoken with words.

If the left hemisphere learns how to retrieve right hemisphere memories and send them to the librarian for processing it produces voluntary, conscious recall of events (as one reconstructed them.) Right hemisphere memory cannot be focused so it is impervious to suggestion and interpretation, the same is not true for the left, so reconstructions can be very faulty and have many suggested details.

**Importance of a Strong Joyful Identity (LIFE Model)**

The ability of an individual to experience and integrate the right hemispheric memories related to a trauma is limited by two factors: the strength of his joyful identity in the right prefrontal cortex, and his learned capacity to regulate the negative emotions and return to joy. Several key emotions to be regulated are: terror, rage, shame, disgust, humiliation, hopeless/despair. (Schore) The individual will not be able to tolerate a higher level of these negative emotions than the capacity she has grown to withstand the positive emotion of joy. Thus her emotional capacity to contain a traumatic event in memory is set by the growth level achieved in her orbital prefrontal cortex. This makes joy, a joyful identity, and the capacity to return to joy from negative feelings, the limiters of trauma recovery.

**Characteristics of a Healthy Bond (LIFE Model)**

- Healthy Bonds grow stronger by moving closer or moving apart
- Healthy Bonds grow stronger by sharing positive and negative emotions
- Healthy Bonds help all parties feel stable and act like themselves
- Healthy Bonds provide freedom and connection
- Healthy Bonds stretch limits and capacities slightly to promote growth (Schore)

**Importance of Joy to God (Wilder)**

The place of joy in God's kingdom makes joy an eternal-life issue. Scripture says, "The joy of the Lord is your strength." (Nehemiah 8:10b KJV) The Psalmist says, "In thy presence is fullness of joy." (Psalms 16:10b KJV) Jesus gave joy as the reason for his teaching. "These things have I spoken unto you, that my joy might remain in you, and that your joy might be full." (John 15:11 KJV) God's face is given as the source of joy in both the Old and New Testaments. Peter quotes from the Psalmist, "Thou hast made known to me the ways of life; thou shalt make me full of joy with thy countenance." (Acts 2:28 KJV) Another psalm says, "Blessed is the people that know the joyful sound: they shall walk, O LORD, in the light of thy countenance." (Psalms 89:15 KJV)

Jesus could face his hardest hour because he knew the way back to joy. Joy also brought him through. "Who for the joy that was set before him endured the cross, despising the shame." (Hebrews 12:2 KJV) He knew there
was a path back from pain and shame. Returning to joy was how he approached his death.

There are many scriptures that will tell us that we can return to joy from times of distress.

- Weeping may endure for a night, but joy cometh in the morning. (Psalms 30:5 KJV)
- They that sow in tears shall reap in joy. (Psalms 126:5 KJV)
- [From] their shame...and confusion...they shall rejoice. (Isaiah 61:7 KJV)
- I will turn their mourning into joy, and will comfort them, and make them rejoice from their sorrow. (Jeremiah 31:13 KJV)
- Make me to hear joy and gladness; that the bones which thou hast broken may rejoice. (Psalms 51:8 KJV)

Many of these scriptures come from the psalms or songs of God. Singing our way to joy is strongly recommended. Many of the Psalms start a long way from joy and then we follow as the psalmist sings us back home to Camp Joy.

References

4. Some of the material in this paper is based on a presentation by Schore of his, as of yet, unpublished book Affect Regulation and the Repair of Self. He read portions of the manuscript at a conference on March 15, 1997 at the Newport Beach Psychoanalytic Institute.
8. Wilder, E. James, The Red Dragon Cast Down, (Grand Rapids, MI: Chosen Books) To be released summer 1999