

POMONA COLLEGE

**THE IMPACT ON THE HUMAN PSYCHE
OF THE RISE OF CIVILIZATION**

JUNE 6, 2015

**THE INTERPERSONAL NEUROBIOLOGICAL
ORIGINS OF EMOTIONAL WELLBEING**

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- Leckman and March, Developmental neuroscience comes of age, *J. Child Psychology and Psychiatry*, 2011: Describe **“the phenomenal progress of the past three decades in the developmental neurosciences.”**
- “Over the past decade it has...become abundantly clear that...**the dyadic relations between child and caregivers within the first years of life can have direct and enduring effects on the child’s brain development and behavior.**”

- “The **enduring impact of early maternal care** and the role of epigenetic modifications of the genome **during critical periods in early brain development in health and disease is likely to be *one of the most important discoveries in all of science that have major implications for our field.***”
- Brain development not just genetically encoded; needs epigenetic social experiences. Not one or other but **gene-environment interactions, mother nature *and* mother nurture combine to shape human nature.**
- Here briefly review my ongoing work (1994-2015) in developmental neuroscience and attachment.

- Schore (*Affect Regulation and the Origin of the Self*, 1994) on **developmental origins of emotional well-being**:
- “The understanding of early development is one of the fundamental objectives of science. The beginnings of living systems set the stage for **every aspect of an organism’s internal and external functioning throughout the lifespan.**”
- “Events that occur during infancy, especially transactions with the social environment, are indelibly imprinted into the structures that are maturing in the first years of life.

- “The child’s **first relationship**, the one with the mother, acts as a template, as it permanently **molds the individual’s capacities to enter into all later emotional relationships.**”
- “These early experiences shape the development of a unique personality, its **adaptive capacities as well as its vulnerabilities** to and resistances against particular forms of future pathologies. Indeed, they profoundly influence the emergent organization of an integrated system that is both stable and adaptable, and thereby the **formation of the self.**”

- Schore (1994): offers **interpersonal neurobiological model of attachment.**
- J. Schore & A. Schore (Modern attachment theory: The central role of affect regulation in development and treatment, *Clinical Social Work J.*, 2008):
- “We suggest that in line with Bowlby’s fundamental goal of the **integration of psychological and biological models of human development**, the current clinical and experimental focus on how affective bodily-based processes are nonconsciously interactively regulated...**has shifted attachment theory to a regulation theory.**”

ATTACHMENT

JOHN BOWLBY

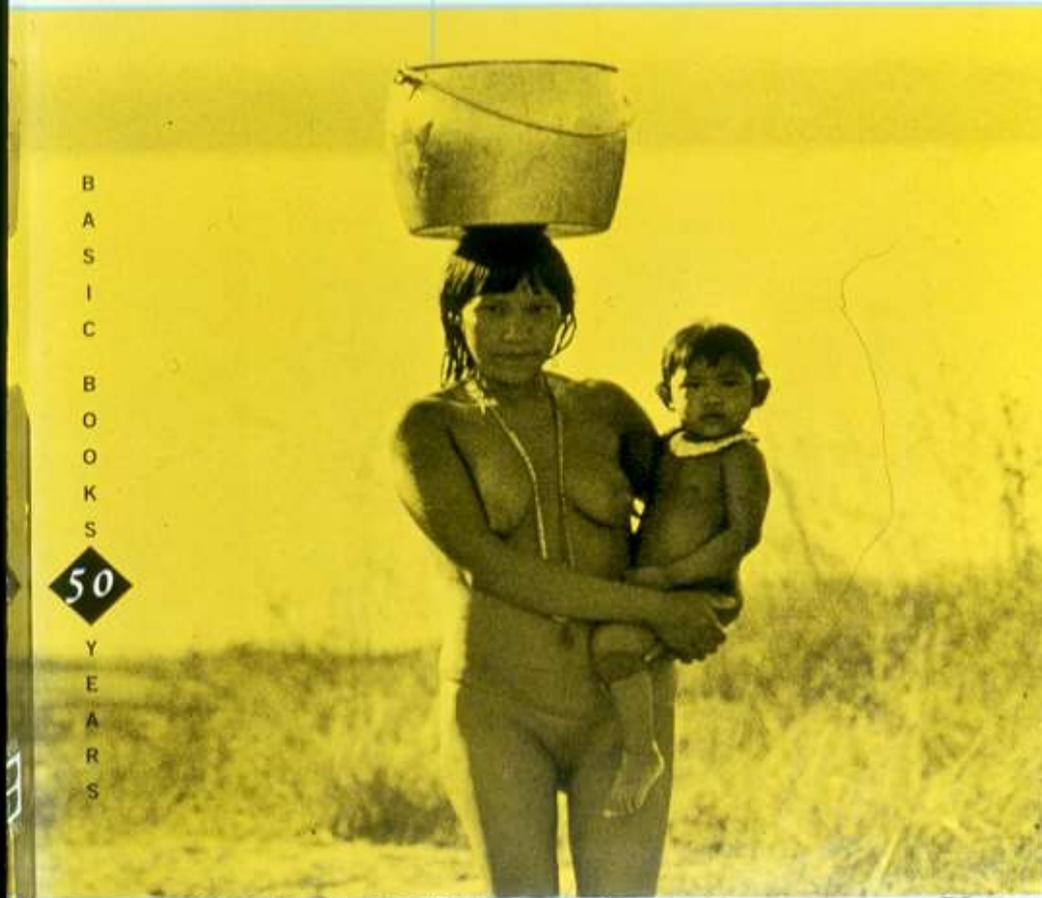
FOREWORD BY

ALLAN N. SCHORE

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- Schore (*Science of the Art of Psychotherapy*, 2012):
- **“Attachment theory, first created by...John Bowlby over 50 years ago, is now revitalized, particularly by its deep connections with neuroscience.** At this point in time, we have in attachment theory a coherent theory of development that is grounded in both psychological science and neuroscience, and thereby is on a much firmer ground than it used to be.”
- Schore (1994-2015): **relational, social-emotional attachment experiences shape developing “social,” emotional” right brain and thereby emotional well-being in later stages of life.**

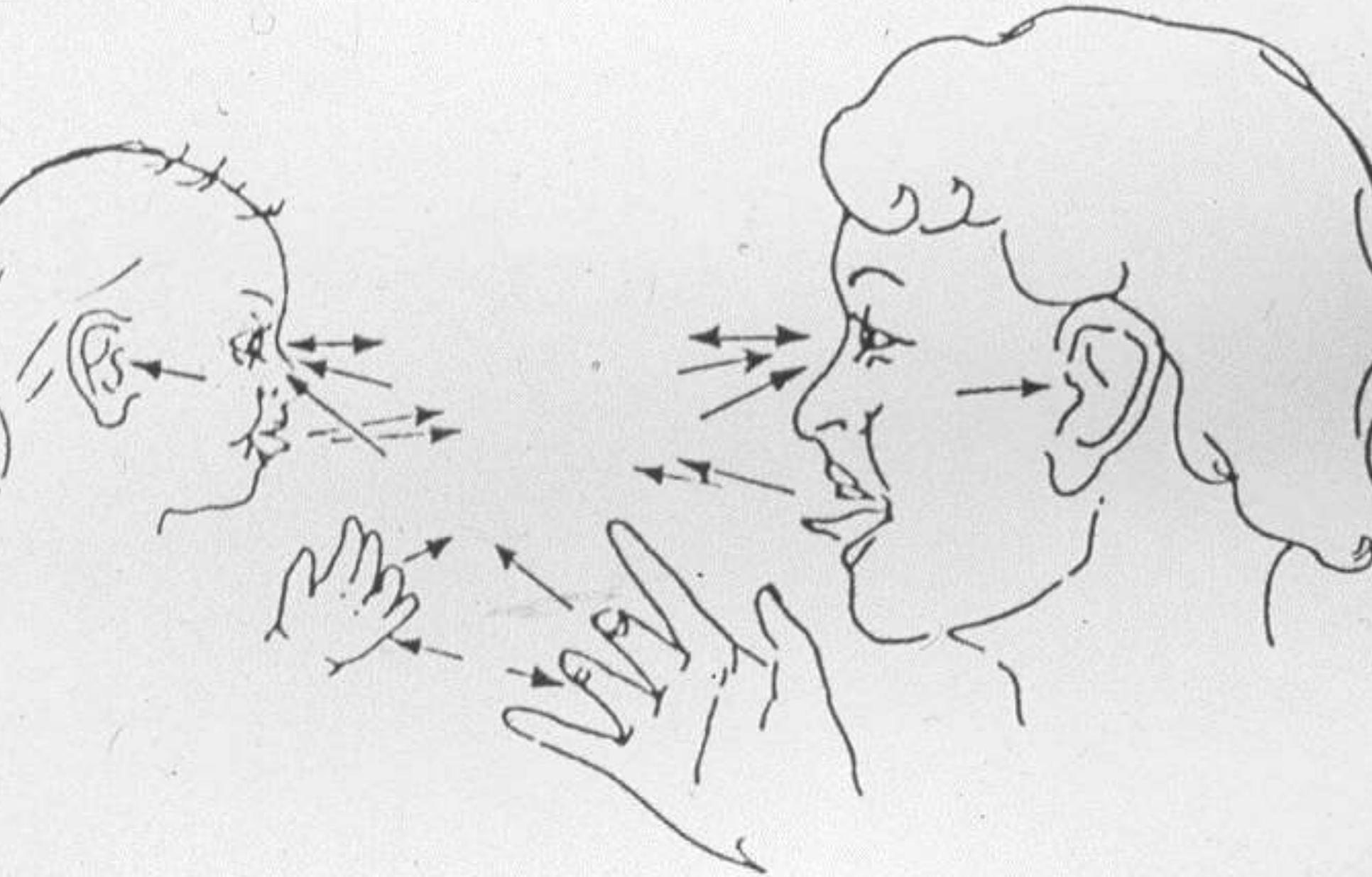
- **Regulation theory, overarching model of development, psychopathogenesis, and treatment of right brain implicit subjective self.**
- Modern attachment theory and regulation theory offer pragmatic implications for neuroscience, pediatrics, developmental psychology, social work, psychoanalysis, infant mental health, behavioral biology, psychiatry, psychotherapy, and family law.
- **Optimal attachment experiences facilitate experience-dependent maturation of developing “emotional” right brain, core of the self, and thereby emotional well-being in later stages of life.**

- Schore (*Science of the Art of Psychotherapy*, 2012):
- “There is now agreement...that **the essential task of the 1st year of human life is the co-creation of a secure attachment bond of emotional communication between the infant and his/her primary caregiver.**
- The baby **communicates** its burgeoning positive emotional states (e.g., joy, excitement) and negative emotional states (e.g., fear, anger) to the caregiver so that she can then regulate them.
- **The attachment relationship shapes the ability of the baby to communicate with not just the mother, but ultimately with other human beings.”**

- Walker-Andrews & Bahrick (*Infancy*, 2001):
- **“From birth, an infant is plunged into a world of other human beings in which conversation, gestures, and faces are omnipresent during the infant’s waking hours. Moreover, these harbingers of social information are dynamic, multimodal, and reciprocal.”**
- Paradigm shift in conception of infancy. From beginning, infant relating to social environment. Emotional and social, not just cognitive development.
- **Sentient being, capable of perception, sensation and feeling. Emerging subjectivity (developing mind) created in an intersubjective context.**

- Tirassa (2006): “The **infant’s subjective perspective** of herself as immersed in an all-social world...against which she can interact with her **caregivers**, **communicating with them**, trying to make sense of what they do and their attempts to **communicate with her**, acquiring the first elements of the **cultural environment** in which she happens to live.”
- Infants don’t use verbal language, but with others who intuitively understand nonverbal communications.
- In order to process these dyadic communications, infant seeks **proximity to mother**, who must be subjectively perceived as **predictable, consistent, and emotionally available**.

- Bowlby (1969): mother-infant attachment communications are “accompanied by **the strongest of feelings and emotions**, and occur within a context of **facial expression, posture, tone of voice...**”
- Bowlby (1991): “**Emotion is nonverbal communication** of basic but very powerful attitudes in mind and potential action.”
- Schore (1994): in episodes of **right brain-to-right brain visual-facial, auditory-prosodic, and tactile-gestural emotional transactions**, sensitive attuned primary caregiver is receptive to infant’s bodily-based nonverbal attachment communications.



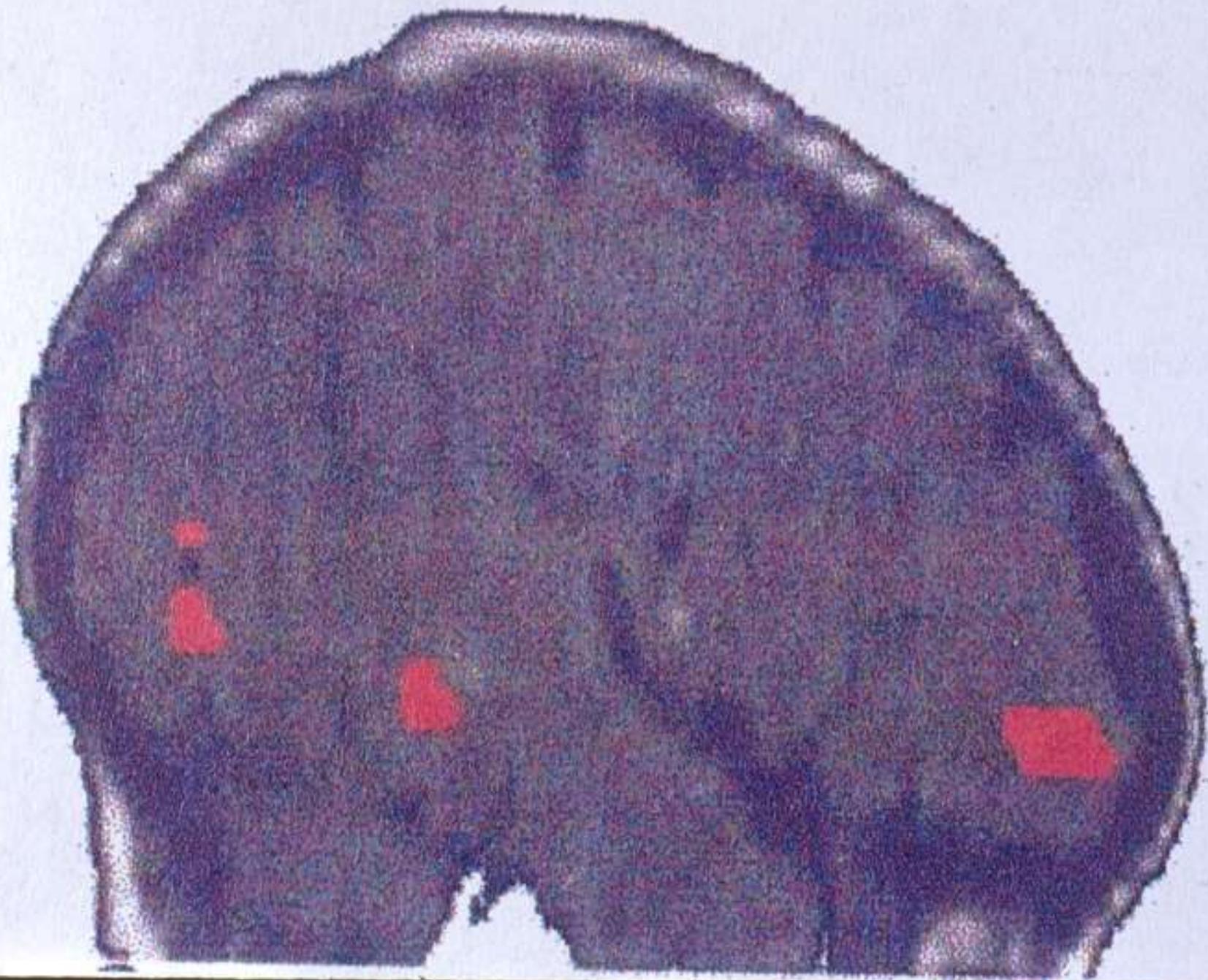
- Attachment emotional communications between **infant's right brain and mother's right brain.**
- ***Infant:*** “The **right hemisphere can be considered dominant in infancy**, for the type of visual and acoustic communication which is relevant for the prelinguistic child.” (Brown and Jaffe, *Neuropsychologia*, 1975).
- ***Adult:*** “The neural substrates of the perception of **voices, faces, gestures, smells, and pheromones**, as evidenced by modern neuroimaging techniques, are characterized by a general **right-hemispheric functional asymmetry**” (Brancucci et al., *Proc. Royal Soc. London B*, 2009).

**“Life began with waking up and loving my
mother’s face”
George Eliot**

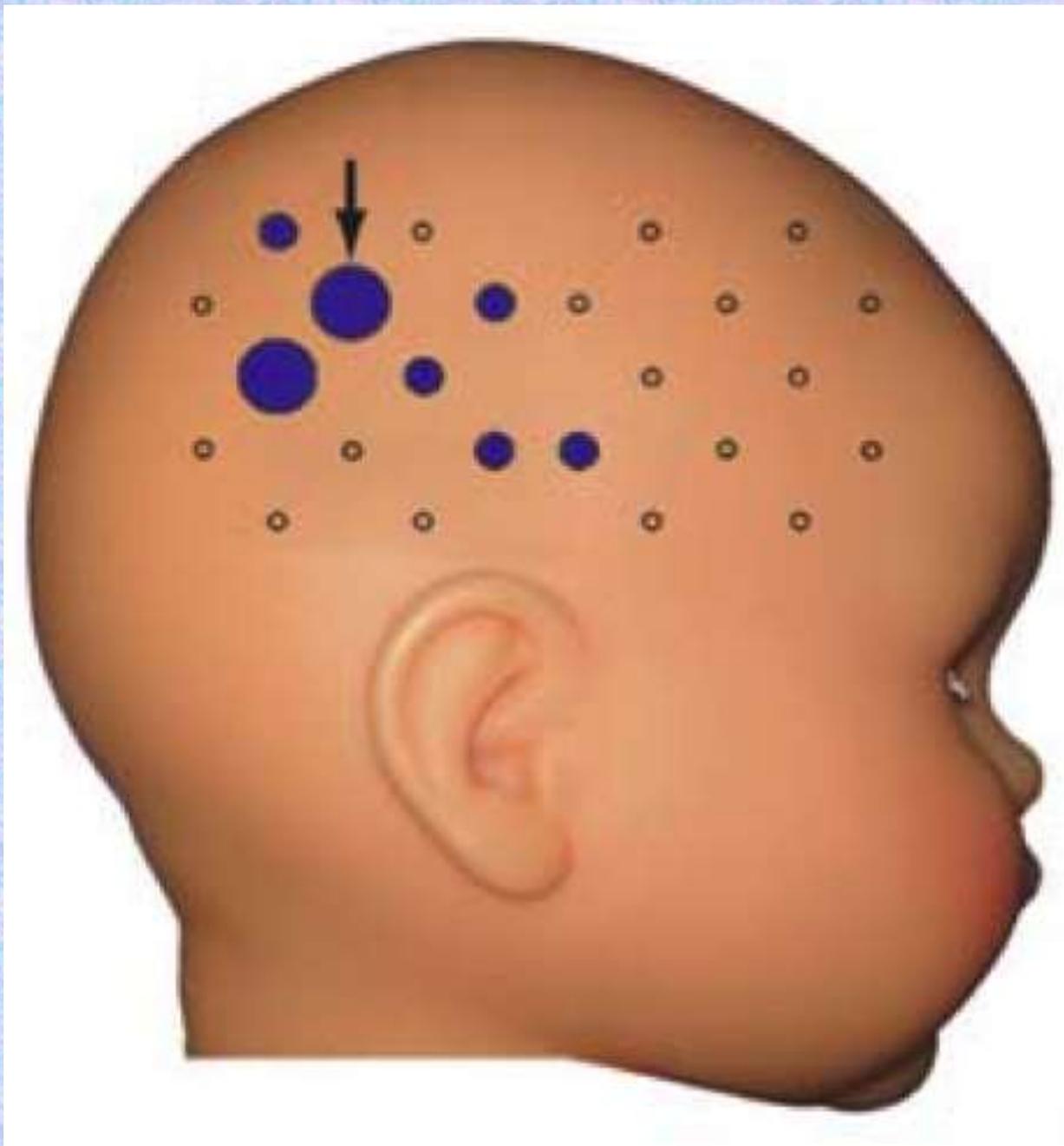




- **RH visual-facial attachment communications**
- Grossmann et al. (2007): **4-month-old infants** presented with images of a **female face gazing directly ahead** show enhanced gamma electrical activity over **right** prefrontal areas.
- Nakato et al. (2009): near-infrared spectroscopy research reveals **5-month-olds' RH responds to images of adult female faces.**
- Tzourio-Mazoyer et al. (2002): PET study of **2-month-old infant looking at image of a woman's face; activation of infant's RH.**



- **RH auditory-prosodic attachment communications**
- Mento et al. (2010): EEG study of **auditory pitch** processing in preterm infants born at 30 gestational weeks: “These findings suggest that the **earlier right structural maturation in foetal epochs** seems to be paralleled by a right functional development.”
- Telkemeyer et al. (2009): NIRS of **2-6 day neonates** show “responses to slow **acoustic** modulations are lateralized to the **right hemisphere.**”
- Homae (2006): “**Prosodic** processing in **3-month-old infants** is subserved by the **right** temporoparietal region.”



- **RH tactile-gestural attachment communications**
- Nagy (*Infant Child Develop.*, 2006): study human neonates in their first 3-96 hours of life, and find a “lateralized system for neonatal imitation.”
- **“The early advantage of the right hemisphere (Chiron et al., 1997; Schore, 2000; Trevarthen, 2001) in the first few months of life may affect the lateralized appearance of the first imitative gestures.”**
- Sieratzki & Woll (*Behav. Brain Sci.*, 2005) on touch and RH: **“The emotional impact of touch, the most basic and reciprocal mode of interaction is also more direct and immediate if an infant is held to the left side of the body.”**



- **RH tactile-gestural attachment communications**
- “Along the right hemisphere affect-communication vector, left-sided cradling facilitates the flow of auditory and visual communication between mother and infant and channels somato-affective feedback and infant sound to the mother’s right hemisphere, which in turn tunes the melody of the mother’s voice - the lullaby will not sound the same, and will not feel the same with the baby on the other side.”
- **“The role of the right hemisphere is crucial in relation to the most precious needs of mothers and infants.”**

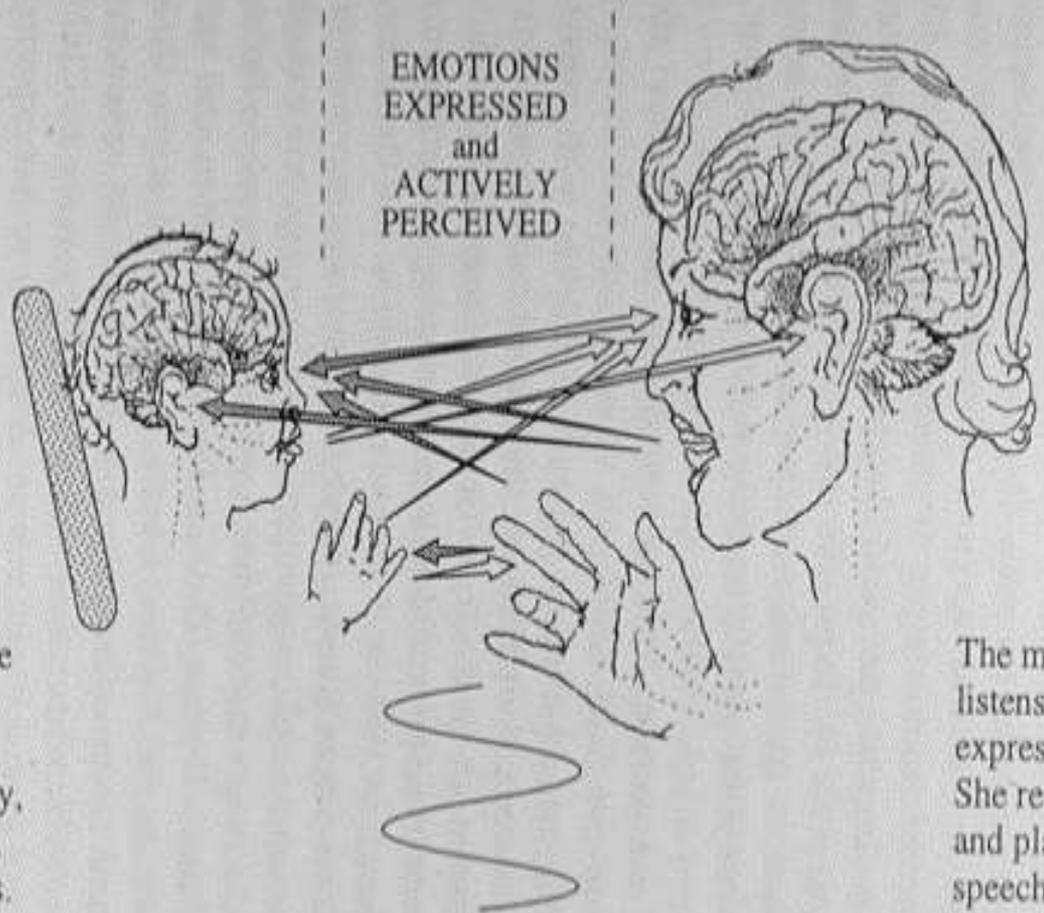
- **RH tactile-gestural attachment communications**
- **McGilchrist (2009): “The right hemisphere, is...more closely in touch with emotion and the body.”**
- **Montirosso, Borgatti, & Tronick (2010): observe left-sided regulatory gestures when infant stressed.**
- **Show “greater activation of the right hemisphere... during a stressful condition there is a state-dependent activation of the right hemisphere.”**
- **“The right hemisphere is more involved in the social and biological functions regarding infant caregiver emotional bonding (Schore, 2005; Siegel, 1999).”**

- Mother not only receives infant's right brain emotional communications, but then interactively regulates them.
- **Attachment = interactive regulation of emotion.**
- **Baby becomes securely attached to psychobiologically attuned caregiver who minimizes negative affect (e.g., fear, in soothing) and maximizes positive affect (e.g., joy, in play).**
- “It is the **emotional availability of the caregiver** in intimacy which seems to be the most central growth-promoting feature of the early rearing experience.”
- Winnicott (1986): “**The main thing is a communication between the baby and the mother in terms of the anatomy and physiology of live bodies.**”



- Ovtscharoff & Braun (*Neuroscience*, 2001):
- **“The regulatory function of the newborn-mother interaction may be an essential promoter to ensure the normal development and maintenance of synaptic connections during the establishment of functional brain circuits.”**
- Human brain growth spurt. Brain doubles size 1st year.
- Lagercrantz & Ringstedt (2001): prenatal and postnatal periods rate of synaptogenesis estimated at **40,000 new synapses every second.**
- Schore (1996): **“The self-organization of the developing brain occurs in the context of a relationship with another self, another brain.”**

Primary Inter-Subjectivity

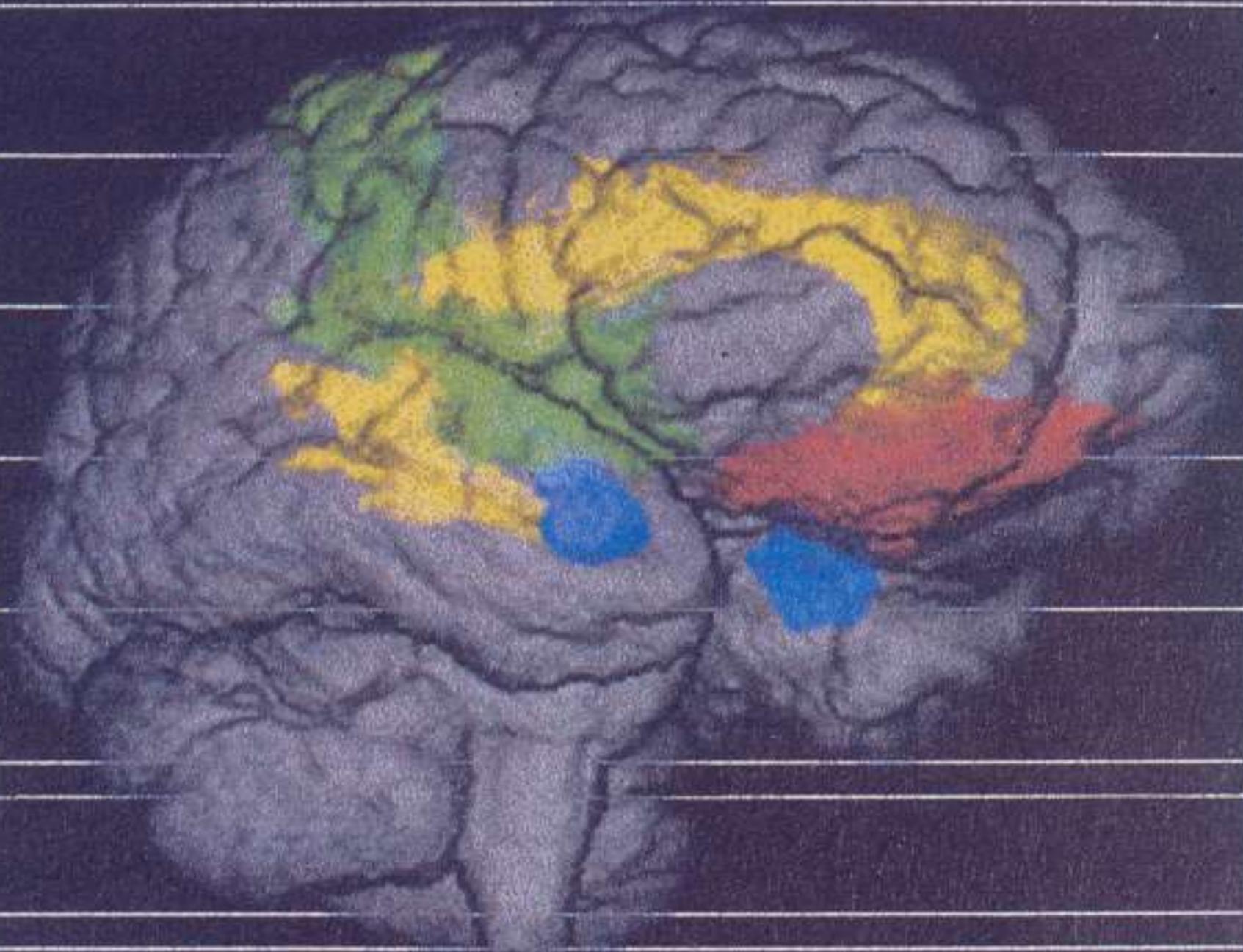


The baby, attracted to the mother's voice, face expressions and hand gestures, replies playfully, with affection; imitating, and provoking imitations.

The mother watches and listens, anticipating the baby's expressions intuitively. She replies sympathetically and playfully, with 'motherese' speech, touches and face and hand expressions

PROTOCONVERSATION
Rhythmic Turn-Taking
of Expressive Acts

- Schore (1994): right brain-to-right brain **attachment experiences impact experience-dependent maturation of infant's developing right brain.**
- Chiron et al. (*Brain*, 1997): **“The right brain hemisphere is dominant in human infants.”**
- Allman et al. (*Trends in Cognitive Sciences*, 2005):
“The strong and consistent predominance for the right hemisphere emerges postnatally.”
- Howard & Reggia (*Brain and Cognition*, 2007):
“Earlier maturation of the right hemisphere is supported by both anatomical and imaging evidence.”



- Lenzi et al. (*Cerebral Cortex*, 2009): fMRI study of mother-infant emotional communication offer data “supporting the theory that **the right hemisphere is more involved than the left hemisphere in emotional processing and thus, mothering.**”
- Minagawa-Kawai (*Cerebral Cortex*, 2009): near-infrared spectroscopy study of infant-mother attachment at 12 months, “**our results are in agreement with that of Schore (2000) who addressed the importance of the right hemisphere in the attachment system.**”

- Ratnarajah, ... Meaney, & Qiu. (*NeuroImage*, 2013):
- **[I]n early life the right cerebral hemisphere could be better able to process...emotion (Schore, 2000; Wada and Davis, 1977). This idea appears consistent with our findings of rightward asymmetry in the ...limbic structures...These neural substrates function as hubs in the right hemisphere for emotion processes and mother and child interaction.”**
- Noriuchi et al. (*Biol. Psychiatry*, 2008): **activation of mother’s right hemisphere during moments of maternal love triggered by viewing video of her own infant.**

- Relational experience induces neuroplastic **changes not only in the infant's brain, but in mother's brain.**
- Kim et al. **The plasticity of human maternal brain:** Longitudinal changes in brain anatomy during early postpartum period. *Behavioral Neuroscience*, 2010.
- Report from 2-4 weeks to 3-4 months **increased gray matter in mother's brain**, including **right** insula, hypothalamus, anterior cingulate, and amygdala.
- “The structural changes...were predicted by a mother's positive perception of her baby at the first month postpartum. Thus, **the mother's positive feelings for her baby may facilitate the increased levels of gray matter.**”

- Schore & McIntosh (2011): “Studies now show that **one parent is the primary organizer of the infant’s stress states, and in nuclear setups, this is usually the mother.**”
- Gunnar (2000): **maternal care within attachment relationship shapes infant’s stress regulating hypothalamic-pituitary-adrenocortical (HPA) axis.**
- Wittling (1997): **RH regulates HPA; control of vital functions supporting survival enabling organism to cope with stresses / challenges.**

- Schore (1994): **subsequent to child's attachment to mother in 1st year, forms another to father in 2nd**
- Herzog (2001): "The biorhythmicity of man with infant and woman with infant" affords infant to have **"interactive, state-sharing, and state-attuning experiences with two different kinds of caregivers."**
- Schore (2003): **father later critically involved in male and female toddler's aggression regulation [vs. earlier mother and fear regulation]**
- Braun's laboratory in Germany (2006): **paternal care affects synapse formation of the developing brain.**

- Abraham et al., **Father's brain is sensitive to child care experiences.** PNAS USA, 2014.
- Study parental brain response to infant stimuli using fMRI. Measure **“primary caregiving” mothers and “secondary caregiving fathers.”** Mean age of infants – 11 months.
- Describe a “parenting caregiving” expressed in two different brain systems: “subcortical-paralimbic structures implicated in emotional processing and cortical areas involved in social understanding.”
- **Mothers showed greater activation in the emotional processing network and fathers in later-developing social cognitive circuits.”**

- Schore (1994-2015): **right brain = neurobiological substrate of implicit (unconscious) subjective self.**
- Psychoanalysis = scientific study of the unconscious. Developmental neuropsychanalysis studies **early development of the UCS mind (deeper levels of the “human psyche”)**.
- Right brain = **psychobiological substrate of the human unconscious**, as described by Freud.
- Schore (2003): UCS right brain implicit self now described as “a cohesive, active mental structure that continuously appraises life’s experiences and responds according to its scheme of interpretation.”

- “In contrast to a static, deeply buried storehouse of ancient memories buried and silenced in ‘infantile amnesia,’ contemporary intersubjective psychoanalysts now refer to a “relational unconscious,” whereby **one unconscious mind communicates with another unconscious mind.**”
- Tucker and Moller (2007): “The right hemisphere’s specialization for emotional communication through nonverbal channels seems to suggest a domain of the mind that is close to the motivationally charged psychoanalytic unconscious.”

- Essential function of early evolving **right brain subjective self** is to generate a **background sense of emotional wellbeing**, an implicit sense of security that operates beneath levels of conscious awareness.
- **Schore** (2012): “In human infancy, right brain functions are dominant and need to be allowed to fully mature. Throughout life, the right, and not left brain, is centrally involved in critical **survival functions**: the allocation of **attention**, the capacity to experience **positive and negative emotions**, the **regulation of stress**, the ability to **empathically and intuitively** read the emotional states of other human beings, and indeed, **morality**.”

- **Schore Foreword in Narvaez (2014):** book offers “a coherent and comprehensive affectively based alternative to the traditional cognitive explanations of moral behavior...the neurobiological model of morality model of this work elaborates multiple potential mindsets in moral structure – **safety, engagement, and imagination.**
- **The safety ethic, which begins its maturational trajectory at birth, is shaped by the infant’s earliest affect communicating and regulating transactions with the mother’s right brain.”**

- “The developmentally later appearing **engagement ethic** is impacted by **right brain-to-right brain** social-emotional communications over the later stages of the first year. This ethical mindset is characterized...as a “baseline for human nature,” and its emergence is dependent upon experiences of “relational attunement” and “present moment intersubjectivity...”
- “I would suggest that the engagement ethic, which develops in what Narvaez describes as ‘face-to-face’ relational contexts is unknowable to the verbal left brain but knowable in terms of bodily-based affective experiences to the right brain.”

- “**Later in the second year** the caregivers are directly influencing the appearance of another component of our moral heritage, **communal imagination**. Narvaez notes that a well-functioning communal imagination ethic responds to and enhances the intuitions and instincts of the engagement ethic and keeps control of the survival system.”
- “The reader will note that **many of the essential neurobiological processes involved in moral functioning are processed in the cortical and subcortical areas of the “emotional” right brain.**”

- Schore (1994): **attachment source of right brain functions of emotional wellbeing over life span.**
- Sullivan & Dufresne (2006): **“right hemispheric specialization in regulating stress - and emotion-related processes.”**
- Decety & Chaminade (2003): **“Mental states that are in essence private to the self may be shared between individuals...self-awareness, empathy, identification with others, and more generally intersubjective processes, are largely dependent upon...right hemisphere resources, which are the first to develop.”**

- Schutz (2005): “The right hemisphere operates a distributed network for rapid responding to **danger** and other urgent problems. **It preferentially processes environmental challenge, stress and pain** and manages **self-protective responses such as avoidance and escape.**”
- Hecht (2014): “[T]he **right hemisphere** has a relative advantage over the left hemisphere mediating **social intelligence – identifying social stimuli, understanding the intentions of other people, awareness of the dynamics in social relationships, and successful handling of social interactions.**”

- De Pisapia et al. Interpersonal competence in young adulthood and right laterality in white matter. *Journal of Cognitive Neuroscience*, 2014.
- Study 6 major WM tracts by diffusion tensor imaging scanning; interpersonal competence questionnaire.
- **Interpersonal competence: “the capacity to interact and communicate with others, to share personal views, to understand the emotions and opinions of others, and to cooperate with others or resolve conflict should it occur.”**

- “**Higher interpersonal competencies are related to higher WM integrity in several major tracts of the right hemisphere...** This finding supports evidence in the literature that points to the fundamental role of the right hemisphere in social cognition.”
- “The finding may have **implications** for theories claiming that the **right hemisphere** plays a major role in modulating emotion and nonverbal communication during the **first interpersonal relationship that every human being experiences, namely the infant–mother relationship (Schore, 1997, 2000, 2009).**”

- “Our results support this hypothesis... **Schore** (2001) also suggested that **dysfunction** in the development of the **right hemisphere** might affect infant mental health and...social difficulties in later stages of development.”
- Schore (2012): “The emotional relational environment provided by the primary caregiver shapes, **for better or worse**, the experience-dependent maturation of the brain systems involved in attachment functions that are accessed throughout the life span.”
- Best current description of path of infant brain development is that it is “**malleable**” (not “resilient”).

- Regulation theory, development, psychopathogenesis, and treatment of the right brain subjective self
- Schore (*Infant Mental Health Journal*, 2001):
“**relational trauma**” imprints permanent **physiological reactivity of right brain and a susceptibility to later disorders of affect regulation**, expressed in a deficit in coping with future social-emotional stressors.
- Schore (*Australian New Zeal. J. Psychiatry*, 2002):
early **attachment trauma (abuse/neglect)** associated with **psychopathogenesis of PTSD**.
- Schore (*Psychotherapy*, 2014): “**The right brain is dominant in psychotherapy.**”

THE SCIENCE
OF THE ART OF
PSYCHOTHERAPY



ALLAN N. SCHORE

- **Broader cultural and political implications**
- Knickmeyer (*J. Neurosci.*, 2008): “The large increase in total brain volume in the first year of life suggests that this is a **critical period in which disruption of developmental processes**, as the result of innate genetic abnormalities or as a consequence of environmental insults, may have **long-lasting or permanent effects** on brain structure and function.”
- **“Although the first year of life may be a period of developmental vulnerability, it may also be a period in which therapeutic interventions would have the greatest positive affect.”**

- Leckman & March (2011): “A scientific consensus is emerging that the **origins of adult disease** are often found among developmental and biological disruptions occurring during the **early years of life.**”
- Schore, A.N. (*Frontiers in Psychology*, 2014). “**Early interpersonal neurobiological assessment of attachment and autistic spectrum disorders.**”
- Early intervention and prevention during critical periods of right brain development.
- Gluckman & Adler (*Science*, 2004): research in developmental biology and physiology supports “**developmental origins of health and disease.**”

- Prince et al., **No health without mental health**, *The Lancet*, 2007.
- **“Mental disorders increase risk for communicable and non-communicable diseases, and contribute to unintentional and intentional injury...”**
- “In reality, the interactions between mental disorders and other health conditions are widespread and complex...” Mental disorders interact with other conditions, including noncommunicable diseases such as medically unexplained somatic conditions, cardiovascular disease, diabetes, as well as communicable diseases such as HIV/AIDS.

- “We need to understand better the **mechanisms that underlie interactions between mental health and other health conditions.**”
- “**Primary health-care workers need to be trained in recognition and evidence-based treatment of mental disorders.**”
- “We need to promote **holistic models of care**, which integrate psychosocial assessments and interventions seamlessly and routinely into the management protocols for major communicable and diseases of reproductive and **childhood disorders.**”

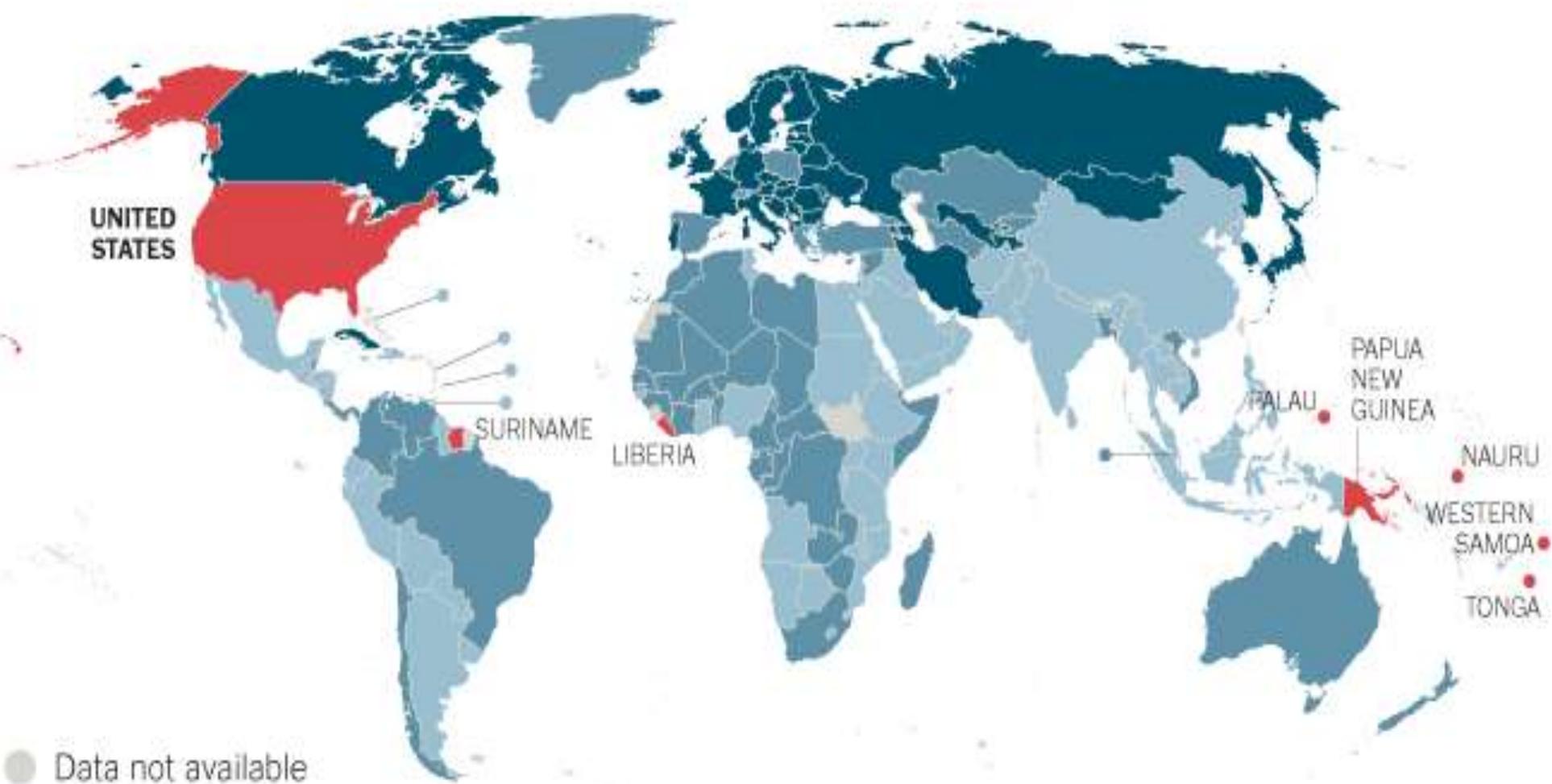
- Schore, (*Infant Mental Health Journal*, 2001):
- “The **earliest stages of humanhood** are critical because they contain within them the **representation of our possible futures** – they model the potential developmental extension of our individual and collective identities...When and where shall we place our current resources so as to optimize the future of human societies?...**How much should we value the very beginnings of human life, in tangible social program dollars.**”
- **Critical role of infant mental health to adult mental health and later emotional well-being.**

- **UNICEF** report, “**Child Well-Being in Rich Countries, 2013: (US 26/29)**”
- “It is perhaps no longer necessary to argue the case for the **importance of the early years**. Advances in both **neuroscience** and social science have repeatedly confirmed that it is at this time that genetic potential interacts in infinitely complex ways with early experience to construct the neural pathways and connections that quickly become both the foundations and the scaffolding for all later development.”
- “**It is therefore at this time that the child’s wellbeing, health and development are most in need of society’s concern and protection.**”

Paid Maternal Leave: Almost Everywhere

The United States is one of only eight countries, out of 188 that have known policies, without paid leave.

Countries with paid leave: ● 26 weeks or more ● 14-25 weeks ● Less than 14 weeks
No paid leave: ●



- Schore, 2001, Introduction to a special issue of *Infant Mental Health Journal*, “Contributions from the Decade of the Brain to Infant Mental Health”:
- “The earliest stages of humanhood are critical because they contain within them the representation of our possible futures—they model the potential developmental extension of our individual and collective social identities. . . . When and where shall we place our current resources so as to optimize the future of human societies? . . . **How much should we value the very beginnings of human life, in tangible social program dollars?**”

- **Science**, July 20, 2014: **Editorial, “A focus on child development,”** K.L. Silver & P.A. Singer (Canada).
- Speak to role of the policy goals of the United Nations.
- **“Investing in child development is the foundation for improved health, economic, and social outcomes.** Not getting the early years ‘right’ is linked to violent behavior, depression, higher rates of noncommunicable disease, and lower wages, and it negatively affects a nation’s gross domestic product.”
- Emphasis on child development “would put the **focus** where it belongs: **on the end beneficiary, the child,** and her or his potential for development.”

- Refer to “the fundamental importance of early child development to **overall sustainable development.**”
- “Recent **advances in neuroscience** indicate the importance of **healthy brain development in the early years to human capital formation...**A society only reaps the full benefits of a child’s survival if that child becomes a productive individual as an adult.”
- “An increase in thriving children over the next 15 years would lay a stronger foundation for **healthy, prosperous, and peaceful societies.**”
- “**Healthy brain development**” = enduring effects of optimal right brain development, secure attachment, and **relational origins of emotional well-being.**

- Layard, R. et al (2014) **What predicts a successful life? A life-course model of well-being** *The Economic Journal* 124, F720-F738.
- Important findings from a major longitudinal study of UK population conducted by the **London School of Economics**.
- Conclude: **“The most important childhood predictor of adult life-satisfaction is the child’s emotional health, followed by the child’s conduct. The least powerful predictor is the child’s intellectual development.”**

