



Dr. Susan Rich Sheridan is a scholar/teacher with degrees in English, Art and Education. Her **Neuroconstructive**, brain-based theory and marks-based practice of literacy have a twenty-year history, including teaching first grade through college. *Saving Literacy* introduces the **Scribbling/Drawing/Writing** program for children 10 months to 6 years, including developmental benchmarks, lesson plans, evaluation tools, and research questions designed for professional caregivers: preschool and daycare providers, elementary school teachers, child psychologists, art teachers and art therapists, speech pathologists and researchers in child development and education. The goals of the program are sustained attention, emotional control and connection, expanded speech and literacy. Autism and the effects of technology are discussed. Dr. Sheridan has published a companion book for parents, *HandMade Marks*.

“What we most need now... is a fresh perspective on the masses of data that neurobiologists have gathered, and on the puzzles those data pose... How do brains make sense of the world (?)... (A) new general theory... requires new assumptions and new definitions. I believe that the idea of meaning, a critical concept that defines the relations of each brain to the world, is central to current debates in philosophy and cognitive science, and will become so in neurobiology... Doodling can and should accompany if not even precede speaking. Language derives from the dynamics and structure of intentional behavior... and the face and hand areas of the cortex lie side by side, undergoing the same patterns of neural development. They are inextricably linked, as we know from the necessity of moving our hands and fingers as we speak to communicate meaning most effectively.” Correspondence between Dr. Freeman and the author, March 17, 2001.

“Your hypothesis of guidance of (brain) activity into doodling (scribbling, drawing) as a means to approach constructive and intentional control of central (brain) activity is pregnant with all kinds of meaning.” Correspondence between Dr. Freeman and the author, August 5, 2009

“You certainly raise a fascinating and important question when you ask how and at what point scribbles become symbols. Both are expressions of intention, but at very different levels, one being an expression of the developing mind of the individual, the other being an expression of the desire to share insights with other minds. You provide the tools and the raw materials for forging answers... prime research topics for multiple Ph.D. theses.” Correspondence between Dr. Freeman and the author, January 8, 2010.

Walter J. Freeman, M.D., Ph.D., biologist, theoretical neuroscientist, philosopher, Professor of Neurobiology
Walter J. Freeman Neurophysiology Lab for Nonlinear Neurodynamics, University of California, Berkeley, CA.

“The often devastating impact of learning disabilities can be avoided with the right kind of early intervention... This is where your insights and systematic program can be so valuable. You recognize that children can be encouraged to develop the ability to use scribbles and markings as the initial step toward capturing meaning on paper, and perhaps in so doing providing the crucial early experience that will prevent some children from developing learning problems in later years. I think your book and your larger body of work are firmly grounded in science, wisdom and vast experience.” Correspondence between Dr. Royer and the author, 2003.

James M. Royer, Ph.D., Professor of Psychology, University of Massachusetts, Amherst

Scribbles and drawing need to be understood in terms of brain science.

SRS 2009



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SAVING LITERACY

Dr. Susan Rich Sheridan

SAVING LITERACY

How Marks Change Minds

-  Attention
-  Connection
-  Literacy



A Guide for Professional Caregivers
Including Teachers and Therapists
of Toddlers, Preschool and Early Elementary School Children

Dr. Susan Rich Sheridan

SAVING LITERACY

HOW MARKS CHANGE MINDS

A Guide
for Professional Caregivers
Including Teachers and Therapists
of Toddlers, Preschool and
Early Elementary School Children

- Volume I:** **Saving Literacy: How Marks Change Minds**
 A Guide for Professional Caregivers
- Volume II:** **HandMade Marks: A Child's Way Into Literacy**
 A Manual for Parents with Children
 10 months to 6 years

by Dr. Susan Rich Sheridan

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FPO for Infinity

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Other books by Dr. Sheridan:

Drawing/Writing and the new literacy: Where verbal meets visual, 1997.

The Thinking Child, A handbook for parents: How Literacy at home starts with scribbling and drawing, 2002.

HandMade Marks: A Child's Way into Literacy, A Manual for Mothers with Children 10 mos. - 6 years, 2010.

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Helen Messemer-Thomas
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*In memory of
Dr. Elliott Dyer, visionary art and technology educator*

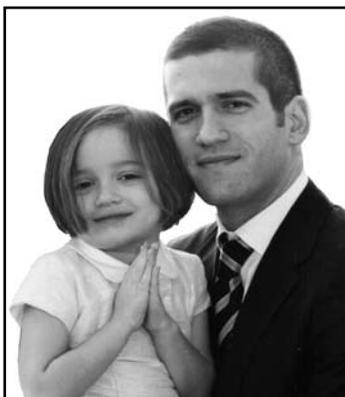


I owe C. Ronald Bechtle, my mentor and my friend, a debt of love to match the wealth of love he's showered on me since I was ten, encouraging me as a painter and as a person. A joyful, working artist at age 84, Charlie's work stays close to the aesthetics of scribbles. Charlie has the kind of brain that's the goal of this book: a brain that reads and writes, loves music and paints. Bates College in Lewiston, Maine has the largest collection of Bechtle's work.



*C. Ronald Bechtle
Painting, "Light Lunch"*

“Complex thought is adaptive, intellectually and emotionally. The fact that many artists return to the abstract scribbles of early childhood may mean that the work we did as young scribblers persists as pleasing and useful and significant behavior even in the adult central nervous system as central pattern generators. Central pattern generators are necessary to all rhythmic behavior, including heart beats, conversations, love-making, parent-child interactions, and the dialogue with the self (through art and language).” Mihaly Csikszentmihalyi, 1993. Parenthetical aside added by Sheridan.



*Panio and his daughter,
Mathilda*

I dedicate this book to writer, editor, and friend, Panio Gianopoulos, whose intellect, editing skills, and belief in the importance of the subject matter made this book possible and who encouraged me to keep trying to publish when I'd nearly given up hope.

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With additional thanks to Nikki Toler, freelance editor, for help with the first proposal for this book (1999) and to Frances Lessor of Amherst for getting the graphics going, as well as to the following people for their ongoing professional and personal support: Tony Burgess, William C. Wolf, Jr., James M. Royer, Peter Ginna, Jaak Panksepp, Walter J. Freeman, Walter Kaszniak, Alwn Scott, John R. Skoyles, Dean Falk, Sylvia Fein, Bruce Charlton, Louis Hodgson, Arthur Marr, Robert Kay, Maulfry Worthington, Susan Stropko, Cindy Matus-Moriss, Michael Silverstone, Alice Carmel, Anne and Duane Nyman, Carroll Reinhardt, Deborah Wasserman, Linda and Julian Garberson; the California group including Jay Greenlinger, Helene and Ken Greenlinger, Liane Brouillette, Kim Burge, Joan Booth, Diane Fassnacht, Dorte Christjansen, Kriste Bennett, Jim Thomas; Terese Giammarco and Donna Mickleson of the Garden Gate Nursery School, Westchester County, N.Y.; the contributing families, including Terese Giammarco and her son, Evan Wolfsdorf; Tina and Zack Lorenzen; Karen Whitney and her niece, Sarah; Jean Guptill and her grandson, Josef Lee; Nikki and Chris Allen and their sons, Parker and Wyatt; Jessica and Jeff Allen and their sons, Ben and Nate; Mathilda and her father; my three children, Jessica, Samuel and Sarah who have never stopped believing in me. Special thanks to Jessica Allen for designing the first version of this book which was called *Families and Drawing, Marks and Mind* (2002). Her initial support and enthusiasm were critical to the venture. Last, but not least, thanks to my sunrise and moon-set, early morning walking group for years of support and friendship.

Special thanks to Helen Messemer-Thomas of Jonesport, Maine for her energy and expertise as a graphic designer and for her belief in the timeliness of this work.

Special thanks to my website designer and manager, Jeannine Lawall.

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The Importance of Mark-Making to Child Development from a Neurobiological Point of View

Mark-Making

The Importance of Marks



Nate

The goal of this parenting/nurturing program

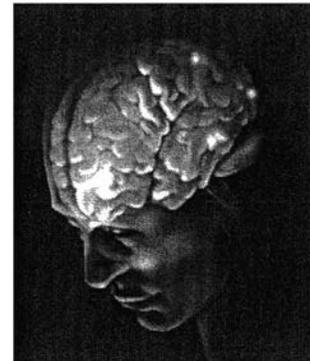
The program described in this book uses children's mark-making in a comprehensive training program designed to strengthen attention, positive emotion, confidence and trust, autonomy, empathy, speech and literacy --- the special cognitive skills and brain states that characterize functional, effective human beings. This program is designed not only for children, but for their caregivers, too. It's a speech and literacy program for everyone!

An emphasis on scribbles and drawing as important **brain-building** behavior makes this book's Neuroconstructive theory of child development¹ and Scribbling/Drawing/Writing practice unique.

A child's brain builds itself in response to

genetics, DNA codes, and the environment. One of the pre-determined ways a child's brain naturally builds itself is by scribbling and drawing. Seemingly formless scribbles both indicate and organize a very special kind of brain activity called symbolic reasoning, or the ability to think using marks. This activity called scribbling prepares the child to "do" mathematics, compose music, write books, create art, and conduct and record scientific experiments.

I coined the term "Neuroconstructive" in my 1990 dissertation. Neuroconstructive theory proposes that the infant's and child's physical, emotional and mental life influence brain growth. Activities can be constructive or destructive. This book proposes that toddlers' scribbles are especially constructive, accessing and organizing special brain patterns for speech and literacy. These



"The Thinking Brain," from BRAIN, MIND AND BEHAVIOR, by Bloom, Lazerson, and Hofstadter; Copyright 1985 by Educational Broadcasting Corporation; Reprinted with permission of W.H. Freeman and Company, All rights reserved.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

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brain patterns are special in terms of potential shapes and layers and rates of vibration,² and are hidden far away from the noisy influence of the rest of the brain, deep inside the koniocortex (“konio” means “dust” in Greek; koniocortex is neurobiologist’s Walter J. Freeman’s term for describing the densest, least specialized, most synchronizing areas in the human brain).⁴ These special, scribbling brain patterns are necessary for symbolic thought. A child’s scribbles indicate readiness to work within this koniocortex, embarking on literacy, thinking with letters, numbers, words, *symbols!*

If the child engages in conversations, hears and watches books being read aloud, scribbles and draws and talks about scribbles and drawings, then, by age five or six, that child’s brain will be equipped to speak and read and write a range of symbols. The child will be able to turn a picture into a poem and a poem into a picture and a picture into a song or a string of mathematics.

The terms used to describe this kind of reading and writing - multiple literacies and translations across systems of representation¹ - mean that the child is born with the potential to think like - to be! - an artist and a writer, a mathematician and a musician, a scientist in everyday terms!

I believe that scribbling is a brain/body operation necessary to the physiology of human perception as that perception includes thinking with symbols. As scribbles circle their way into spirals, these distinctive marks map onto what are called phase portraits,^{1,2,3} or EEG’s of brains which are recognizing something.² The more circular the shape of the EEG, the more orderly the thinking.² And so it occurs with children’s scribbles.^{1,5,6,7} They become increasingly orderly.

According to my Neuroconstructive theory, the marks we call scribbles operate as “primers,” or “bumpers” for creating highly attentive, or “aroused” brain states,^{1,2,4,5,6} allowing children to think increasingly powerfully and efficiently,^{1,3,4} using symbols. Neuroconstructive theory also proposes that scribbling and drawing help children control and re-direct emotions, making even transcendent brain states possible.^{5, 6, 7, 8} Sometimes, one of our poems or paintings or pieces of writing or musical compositions will fill us with such understanding, satisfaction and joy that we feel transported to a higher level of existence. This is what I call a transcendent brain state.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

²Freeman, Walter J.; Broadhead, Peter. 1991. "The Physiology of Perception." *Scientific America*, Feb. 11, 1991. Vol. 264, Pps. 78-85.

³Churchland, Patricia Smith. 1986, *Neurophilosophy*, Cambridge, Mass., MIT Press.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

⁵Sheridan S.R.. 2002. "The Neurological Significance of Children’s Drawings: The Scribble Hypothesis." *Journal of Visual Literacy*; 22 (2):107-128 by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page att:<http://www.sciencedirect.com/science/journal/03069877>

⁶Sheridan, S.R.. 2004. “Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness,” *Toward a Science of Consciousness*, Tucson, abstract #209.

⁷Sheridan, S.R.. 2005. “A Theory of Marks and Mind: the effect of notional systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children,” *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable in on-site version at www.drawingwriting.com by permission by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page att:<http://www.sciencedirect.com/science/journal/03069877>

⁸Sheridan S.R.. 2006. "Glossolalia, Consciousness states, and the mind/body benefits of fluent spiritual speech: Extending the purpose of linguistic experience." www.drawingwriting.com . Poster session, abstract 300, sixth *Toward a Science of Consciousness Conference*. University of Tucson, Tucson Arizona. Downloadable www.drawingwriting.com

Brain scans of children scribbling and drawing will confirm the connections between mark-making, attention, intentional symbolic thinking, (including literacy), and emotional range and control. Supported by that brain research, parents and other caregivers will know that their hunches about the importance of scribbling and drawing are right: mark-making is a very special milestone in child development.

This book proposes three stages of scribbling and drawing - Early, Middle, and Mature or High Stages - as well as three major transformational mark-making stages, which can be used - in an open-ended manner - to chart a child's progress as a symbolic thinker. This is the first time that these formal categories for scribbling have been proposed. One story in this book shows how the act of making a mark on paper calms a child, changing fear and tears into smiles. In another story, an autistic child regains the ability to scribble and to speak after losing both skills at about the age of three, suggesting that mark-making and speech in autistic children are connected.

Each Scribbling/Drawing/Writing exercise in this book includes a section called Field Notes where parents and caregivers are invited to record their observations about child development.

As we take our Field Notes, we can think about these questions:

- 1) Do children engage in scribbling and drawing as if these activities were natural to them? Do they show interest in such activities? Will they do them over increasingly long periods of time?
- 2) Do scribbling and drawing encourage children to connect emotionally, helping them to share ideas, hopes and fears?
- 3) Can scribbling and drawing be used to distract children who are starting to panic or who are fearful or who get frustrated easily? Are scribbling and drawing therapeutic alternatives to emotions like fear and anger? Is part of the brain-based importance of scribbling and drawing emotional self-regulation in children?
- 4) Do scribbling and drawing help children learn to write and read more easily? Are children who scribble and draw more interested in writing and reading, able to sustain both activities over increasingly long periods of time?
- 5) Can we make the larger jump that literacy and human language are strategies devised by the human brain to organize behavior in significant, intentional ways, making possible not just the sensation of emotions but their control, and not just intelligent sounds and behavior, but a vastly expanded, potentially infinite mode of communication using marks of meaning? Symbols - that is, letters, numbers, musical notes, words - make communication with oneself and others possible in ways that transcend time and space, and physical reality.

A list of research questions is included at the end of this book. An on-line location will be provided for parents and caregivers to share and discuss data from their Field Notes. Data from Field Notes may help to answer these research questions.

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If scribbling and drawing are natural ways for children to learn to write and read and also to control impulsivity and mood, as I believe, then, parents and other caregivers need this information.

If literacy (as scribbling and drawing as well as reading and writing) is a strategy for diverting or preventing negative emotions through a flood of overriding positive brain chemicals, as I believe, this is important and useful information for caregivers, from parents to pediatricians to educators.

Until we re-establish *scribbling and drawing as normal and necessary activities in early childhood*, we cannot appreciate the importance of spontaneous mark-making to the development of the young human brain. This book's goal is to establish that importance.

Saving Literacy was written for professional caregivers. There is a companion book, *HandMade Marks*, written for parents of preschoolers to help little children develop their powers of attention, their range and control of emotions, their scope and use of language and literacy as the cognitive bedrock of their lives. *HandMade Marks* was also written for parents whose children are giving them some concern in regard to their development, attentionally, mentally or emotionally.

These two books provide the bridge between children's scribbles and drawing and brain science.

A child's mind is designed to communicate far beyond words and child-art.

Rules of Thumb for Good Caregiving Practices: minimize FEAR, PANIC, and RAGE, maximize SEEKING

Rules of Thumb

Photo ©Marzanna Syncerz

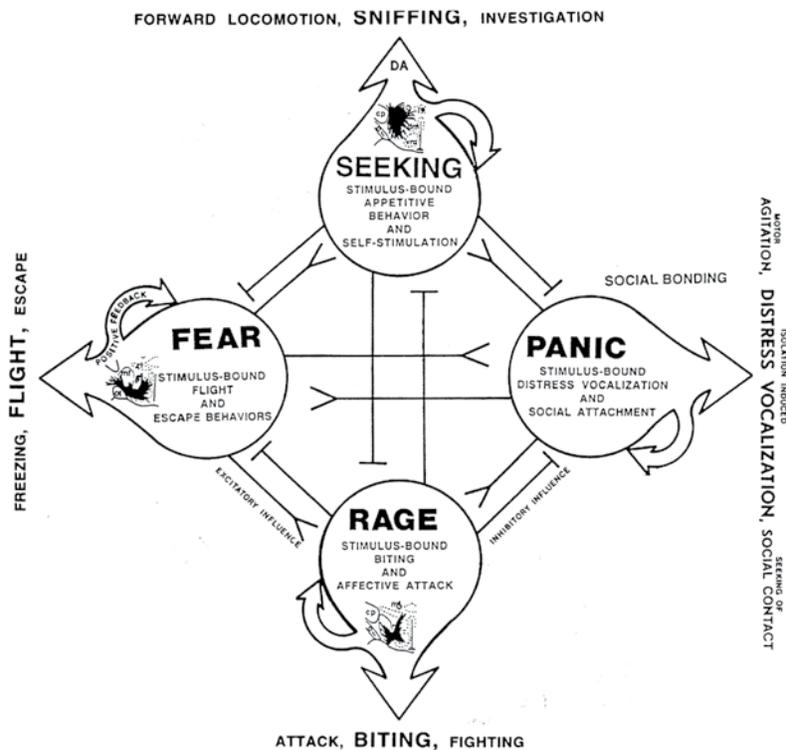


Dr. Jaak Panksepp’s textbook, *Emotional Intelligence*, 1998, changed my thinking about parenting, teaching, and the function of mark-making.

Dr. Panksepp identifies four core emotions: PANIC, FEAR, RAGE and SEEKING.⁹ Using brain chemistry, Dr. Panksepp shows how the first three emotions drive each other; that is, PANIC, FEAR and RAGE give rise to each other and lead back to each other; they are excitatory and inhibitory. A child who is afraid may rage; a

child who is raging may panic. On the other hand, once a child goes into SEEKING mode (and Dr. Panksepp identifies this mode as searching for the things that delight and satisfy a child’s needs to grow and flourish), there are no return routes, in terms of brain chemicals, to RAGE, PANIC

Jaak Panksepp, for the use of figure 3.5, page 53, "The Major Emotional Systems," *Affective Neuroscience*, © 1998. Reprinted by permission of Oxford University Press, Clarendon Street, Oxford, UK, and by permission of original publisher, *Behavioral and Brain Sciences*, Vol. 5 (1982), pps. (407-409).



Rules of Thumb

⁹Panksepp, Jaak, 1998. *Affective Neuroscience*. New York: Oxford University Press.

or FEAR.^{9A} SEEKING inhibits RAGE, PANIC and FEAR neurochemically. The goal of the emotional process is homeostasis. The brain favors a resting state because it conserves energy. So, the goal of SEEKING is not continual seeking, but the finding of the satisfying goal, allowing the brain to rest. The cessation of RAGE, PANIC, FEAR and SEEKING is rewarded by a “feel good” brain chemical. SEEKING is the most efficient method for achieving a resting brain state because it inhibits or stops PANIC, FEAR and RAGE. There are no excitatory neurochemical return routes from SEEKING to RAGE or from RAGE to SEEKING. Panksepp includes the idea of exploratory PLAY in the positive emotion of SEEKING. We will discuss the Panksepp model and the Scribbling/Drawing/Writing theory of emotional control again at the end of this book in the section "Toward a Peaceable Kingdom".

The world-renowned therapist, Alice Miller, PhD. in philosophy, psychology, and sociology, provides important historical overviews on negative child-rearing practices in her books (*For Your Own Good*, 1983; *Breaking Down the Wall of Silence*, 1997; *The Truth will Set You Free*, 2001; *The Body Never Lies*, 2005). Dr. Miller describes childhoods in which panic, fear and, most especially, a child’s humiliation and rage are triggered through profoundly misguided parental control. Many old-fashioned child-rearing practices would be considered emotionally or physically abusive today. Some of these practices persist because parents (who were themselves raised in a constricted, emotionally damaging manner) are sincerely convinced that certain practices are for the child’s own good. With Jaak Panksepp’s quartet of human emotions firmly in mind - PANIC, FEAR, RAGE and SEEKING - we can try to sort out the parenting practices which will, within reason, minimize negative emotions and encourage positive ones, most especially protecting the child from bouts of helpless rage which will have long-term effects in adulthood as depression, rage, and self-destructive tendencies.

In her most recent book (*Animals Make Us Human*, 2009), autistic author, Temple Grandin explains the proper care of animals using Dr. Panksepp’s model of the four core emotions. For her, too, the Panksepp model is of critical importance to her theory and practice of animal care: minimize PANIC, FEAR and RAGE and maximize SEEKING and PLAY. The way to maximize SEEKING and PLAY in animals is by providing the proper environments, activities, and playthings through an understanding of the animal’s core emotion and behavior via direct observations in the field. If we think in terms of animal categories, we humans have the bodies and brains of predators, not prey. We threaten, we chase, we dominate. Yet, we also have the instincts of prey and the options of flight as well as fighting. In addition, we have the option of standing still, or doing nothing, or holding our ground.

Based on Temple Grandin's book, I suggest the following rules of thumb to achieve ideal living conditions for creatures, including our children:¹⁰

^{9A}SEEKING inhibits RAGE, PANIC and FEAR. The goal of the emotional process is homeostasis. The brain favors a resting state because it conserves energy. So, the goal of SEEKING is not continual seeking, but the finding of the satisfying goal, allowing the brain to rest. The cessation of RAGE, PANIC, and SEEKING is rewarded by a “feel good” brain chemical. SEEKING is the most efficient method for achieving a resting brain state because it inhibits or stops PANIC, FEAR and RAGE. There are no excitatory return routes from SEEKING to RAGE or from RAGE to SEEKING.

¹⁰Grandin, Temple, 2009. *Animals Make Us Human. Creating the Best Life for Animals*. Houghton Mifflin Harcourt: Boston, New York.

- The environment must include companionship to prevent PANIC. PANIC is triggered by separation anxiety, when the animal or child is left alone.
- The environment must include safe places to prevent FEAR. FEAR is triggered by scary items - things too big, too loud, too bright, too violent, - whatever the particular brain is conditioned to recognize as threatening. Your child, like the egg-laying hen, may need a cardboard box to retreat to. Figure out what is scaring the child and eliminate that from the environment.
- The environment must include a sense of freedom to prevent RAGE at restraint. The infant normally resists the constraint of clothing, the car seat, the changing table - being strapped into anything. The child absolutely must have the freedom to explore her environment. Thus, as mentioned above, the child needs a safe environment in which to explore. Children who simply cannot be allowed out because the outside world is too unsafe must have places to explore inside the house and they must have places to explore inside the mind.
- The environment must include a sense of the novel to stimulate the SEEKING mode.

The SEEKING mode sets up a positive emotional state in the brain from which there are no return neurochemical paths to PANIC, FEAR or RAGE.

- Panksepp adds another emotional category, PLAY. The child learns her place in the family through PLAY, which, like SEEKING, also releases positive brain chemicals. PLAY, including laughter, creates positive emotions and body/brain states in the child.

These are the basic creaturely conditions for a healthy, happy childhood, on which a happy, healthy adulthood rests.

In addition to the conditions suggested by Temple Grandin, this book adds two more: remove the television and the computer from the young child's environment. (We will discuss this suggestion at greater length later in this book.) Let the child develop in the kind of time and space appropriate to the child's body/brain system which is growing and self-integrating every second of every minute of every day in exquisitely sensitive response to the environment. The child's body and brain will reflect both the damaging and the nurturing opportunities in the environment. Give the child a chance to grow at her own pace in response to tastes, smells, sounds, textures, and sights appropriate to her development. If a child is lucky enough to live near or in the natural world of plants, insects, fish, animals, that natural world combines a wide range of appropriate stimuli. Nature is truly a classroom.¹¹

¹¹Louv, Richard, 2005. *Lost Child in the Woods, Saving Older Children from Nature-Deficit Disorder*. Chapel Hill; Algonquin Books.

Saving Literacy

From the cell on up, life includes freedom and constraint. The cell can move and divide within certain parameters. There are limits. The human in society can move within certain parameters. There are limits.

In childhood and in adulthood, we are frustrated by constraints to our freedom. We try to get out, get away and establish our freedom. We need appropriate outlets for our frustration. We need avenues to freedom. Above all, we need meaning.

Mark-making provides ways to release frustration, to arrest panic and fear and rage, to seek and be free, to discover the avenues of freedom.

“We all move uneasily within our constraints.”¹² Whether we are children or adults, all of us have to deal with constraints - good ones, bad ones. The escape hatches provided by scribbling and drawing, writing and reading help us to handle frustration, to learn and to grow and to be. The very act of thinking provides our own intervention strategies. Children’s earliest scribbles gives rise to the always-available possibilities of the freedom of thinking with pictures, numbers, and words.

Scribbling points the way.



Photo by ©Pavel Losevsky

¹²Jamison, Kay Redfield, *An Unquiet Mind*, page 109, 1999. Vintage Books, New York.

Who, What and Why: Three Roles

Who, What & Why



Photo by ©Larisa Lofitskaya

WHO

Children

This book is for very young children and the people who take care of them, especially the professional caregivers of toddlers, preschool and early elementary school children. This group includes regular classroom teachers, art teachers, day-care providers, psychologists, art therapists, speech pathologists, students and researchers in early education and child development.

WHAT

The Scribbling/Drawing/Writing Program

This book is about a special drawing and writing program where the two mark-making systems are woven together. To tailor this literacy program to little children, we need to include scribbling. A child begins to talk by babbling and a child begins to write by scribbling.

This program begins with activities which come naturally to children: scribbling and drawing. Then, this program builds writing and reading skills into scribbling and drawing. By encouraging the child to *talk* about scribbles and drawings, the program develops speech. By honoring scribbling and drawing, the program makes it clear that marks carry meaning.

WHY?

At risk: attention, connection, literacy.

We need to protect three critical aspects of early childhood: the ability to pay sustained attention (without which no learning can occur); the kind of emotional closeness and empathy learned from face-to-face communication, which makes successful human interaction possible; and an investment in image and text which is necessary to reading and writing across symbol systems in a society where visual and verbal literacy are critically important.

Saving Literacy

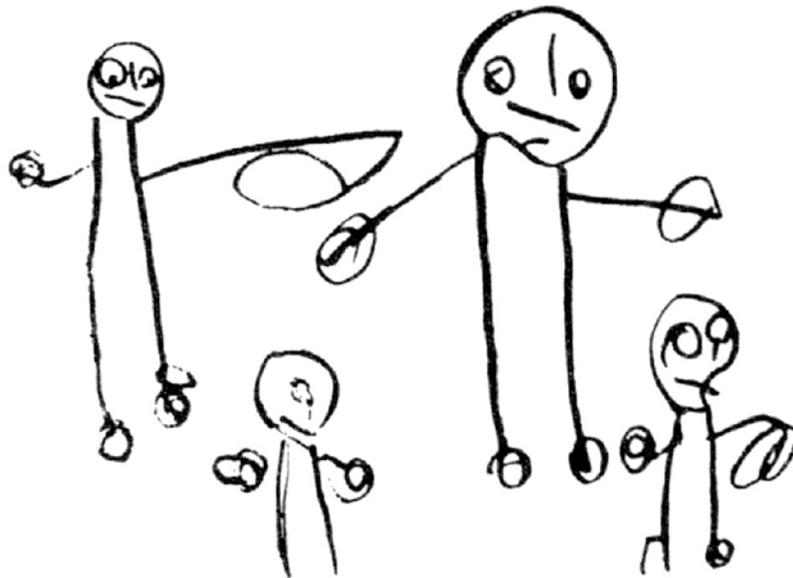


Photo courtesy of Nikki Allen

Technology, including the television and the computer, currently put these three aspects of early human emotional, social and linguistic development at risk by forcing short attention spans, passive reception of image, text and speech, (with the exception of DVD's which teach pre-verbal toddlers to sign) and the restricted use of the body (often just forefingers and thumbs with little game stations) at a time when the whole body needs exercise to grow, including the kind of bilateral mental growth that is encouraged by scribbles and drawing, using hand-made marks.

Can we nurture children so that their ability to pay attention, to make human connections and to be literate in the old-fashioned sense persist, without sacrificing computer skills and computer literacy?

Can we continue to value and appreciate marks that do not move, which exist on paper and canvas, while accommodating a brain that delights in the lighted screen --- where all is change and movement and color and sound and action?



Kellogg, Rhoda, *Analyzing Children's Art*, figures on pages 101 and 109
© 1969, 1970 by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

Old-fashioned nurturing

Little children used to sit, side by side with parents, grandparents, aunts, uncles, older brothers and sisters and learn to read. Little children used to scribble and draw, lying on the floor in a puddle of sunshine, absorbed in the marks that would, one wonderful day, turn into writing and mathematics. Children used to climb up onto laps to share this precious work with someone who was really interested in them. With all this side-by-side talk and reading and scribbling, children learned to relate to others, to communicate and to read.

An old-fashioned childhood? Three important items.

Would we strongly support, or even return to certain aspects of an old-fashioned childhood if we thought those qualities of childhood were important? And, if we did, what aspects would be on our “must-have” list?

To flourish, babies and toddlers must have love. They need physical and emotional nurturing. Children need to be loved and cared for and understood in order to love and care for and understand other people.

Children need to learn to communicate and to care about communicating. To do so, children must have someone who is dedicated to communicating with them. Then, children need time to practice communication using sounds, signs, gestures, speech and marks. They should not be rushed.

Children need to use their hands to make their own marks, literally and figuratively. To make their “mark on the world,” children must make marks with their hands. There are exceptions, of course, in the case of disabilities. But, in general, a child learns to write by making her own scribbles, drawings, and invented spelling and numbers with his or her own hands. A child may also learn to read this way, and, surely, practices reading in this way by talking/reading about his or her own scribbles and drawings. The development and work of the human language-using brain requires the work of the hands and the tongue.

The modes and methods of early nurturing make a difference in the mental abilities of a child, including levels of literacy, creativity, competence, and confidence. Genetics plays a part in a child’s innate brain capabilities, but the early nurturing environment, especially the quality of attention provided by the child’s mother and father and other primary caregivers, strongly influence how the child’s brain grows and learns. The brain is flexible, adaptable, changeable, even in old age. When it is young, the brain can be very strongly influenced in ways that are hard to change. Negative ways of thinking may be reversible, but why not grow effective, positive brains to begin with?

This book is about literacy with a big “L”.

This book champions pre-electronic *and* post-electronic literacy, embracing static image and text *and* kinetic image and text. As luck would have it, “old-fashioned”, pencil and paper literacy ---- handmade marks on paper --- is developmentally appropriate for infants, toddlers, and other youngsters. So, we can have it all! If we hold off on electronic drawing and reading and writing and game-playing until the age of four or five or even six, we’ll allow normal visual, verbal, and emotional/social, and physical development in our children. Then they’ll be ready for the electronic “frosting” on their cognitive cake!

Saving Literacy

This book is about the connections between vision and attention and mark-making and meaning-making. It's about the importance of interactions between caregivers and children around scribbles and drawing, because scribbles and drawing are the place where children begin --- right after cooing, smiling and laughing --- to make meaning.

Saving Literacy emphasizes the importance of the role of mark-making in a young child's life, as the activity where the need to pay attention, to feel connected and to communicate begins.

As professional caregivers, you play several roles in the human adventure into literacy.

1st

First, you need to show interest in and support for a child's scribbles. You do not read them, you do not tell the child what they mean. But you take serious note of them, honoring them as significant marks. Why? Because your support and interest provide emotional motivation for mark-making, or literacy. The child's brain provides its own neurochemical reward for mark-making, but your appreciation enhances that neurochemistry.

2nd

Second, by scribbling, drawing and writing, you join the mark-making. By sharing the activity, you dignify mark-making as a worthwhile activity for adults, too. Why is this important? Children need to see that their marks (as evidence of their thoughts) have relevance for their lives, as they do for yours. Your participation provides additional motivation for a commitment to literacy as an important way to express thought and, in fact, to formulate thought. Without pictures and words and numbers and notes we would be unable to think most of our thoughts. We would be able to feel and to act and to react driven by basic physiological/psychological needs but we wouldn't be making shopping lists or writing symphonies.

3rd

Third, by mark-making with children, you are going to encourage the child's human nature as a mark-maker of meaning. Why is this important? Because a life stripped of marks-based meaning --- including books and paintings and music and mathematics --- is an impoverished life for a human being.

By entering into the following mark-making program, you are going to become as genuinely, naturally, and deeply invested in literacy as a little child. As the child grows, learns and changes through meaningful marks, so you will grow and change, too, experiencing some tremendous transformations. As the subtitle of this book suggests: marks change minds.

Questions & Answers for Professional Caregivers (and other teachers of young children)

Q&A



Photo courtesy of Nikki Allen

Scribbling/Drawing/Writing is like a “do-able” diet. Little changes over time make a difference. People who want to get thinner buy diet books, make charts, add up calories, eat better, exercise more. Caregivers who want to have an even more positive effect on children’s mental and emotional lives, will incorporate the exercises in this book because they are not only “do-able” and effective - but fun.

How much time does the program take?

With the age group targeted in this book, children from sitting-up age to four or five or six years old, a little bit of time every day for mark-making is ideal.

How much does this program cost?

It costs as much as one set of thin markers, one set of fat markers, and a pad of unlined paper, - - inexpensive supplies you can buy at the supermarket or the drug store. Markers, even washable ones, are sometimes better than big, snub-nosed crayons. Crayons require strong bearing down by little hands and some colors do not make much of a mark. You want to set it up so that the toddler’s own marks catch the toddler’s eye, allowing the child to become self-enchanted. I find that thin washable markers are perfect for small hands. A hand that can pick up a minute bit of fluff from the carpet has the manual dexterity to hold a thin marker.

What equipment does the program require?

What you just bought (markers, paper), plus a quiet room at a comfortable temperature with natural light, if possible, and a few objects including safe kitchen utensils or tools or rocks, shells or bones. And silence. Or if you like music, that’s fine, too. Soft, instrumental music without lyrics is a good choice. As you are protecting your child’s eyes and, via her eyes, her brain from visual assault from technology whose raster rates, or screen speeds, are wrong for small children’s brains (and for adult brains, too, who were raised reading books), so you will protect the child’s brain by monitoring the sounds you let into the child’s ears.



Mathilda, drawing, permission of parents

Does a caregiver have to be able to draw to do this literacy program?

No, a caregiver just has to be willing to try.

Does a caregiver have to like to write and read to do it?

No. A caregiver just has to be willing to try.

If there is any math in the program, will it be hard?

There is no math in the program that you do not know already or can't figure out with the child.

Is this program only for children with problems?

Not at all. It is for all children. Yes, children with attention deficits, learning disabilities, speech delays, physical disabilities will benefit--- but every single child is different and every single child is special and every single child has special needs.

Will this program help gifted children?

Yes, because it's an enrichment program.

Is this program only for children of certain ages?

No, this program is for children of all ages, including adult children.

Are there special ages when this program will be most effective?

This program will be most effective if it begins with the child who is ready to scribble, somewhere between one and two years of age. However, it is never too late to benefit from this literacy program.

Is there a time when it is too late for this program to be effective?

It is never too late to scribble, doodle, draw and write, compose or compute.

Is this program only for certain kinds of caregivers?

No. This program is for all caregivers, from day care providers to kindergarten teachers.

Is drawing more useful to boys than to girls for encouraging speech and literacy?

Drawing may be more useful to boys who are at risk for delays, deficits and problems with word retrieval in speech and also in reading and writing than for girls with no problems, but scribbling and drawing are equally useful to girls and boys at risk for delays and deficits.

Do adopted children have special scribbling needs?

Children who have spent time in orphanages are going to need all the affectionate, interested, verbal, physical interaction you can give them. They are going to need all the love and support you can provide. This program provides opportunities for love and support.

A child just draws. He does not read or write. Is there something wrong with his brain?

Try turning off the television and the computer and make sure there are some books around with high-level, complicated illustrations that include as much weirdness and paradox as possible.

See if the child shows an interest. If he looks attentively at the pictures, he is reading. You might start with art books that include the work of MC Escher and René Magritte. Add other surrealist and Dada artists. Throw in some Cubists. Cubism encourages visual sophistication. Young children are capable of such sophistication. Be careful, however, not to offer these images to children who are unused to conceptual drawing. You do not want to put them off by asking them to tackle images which may be too puzzling, at first. Start with Escher and Magritte, De Chirico and Dali, then introduce Picasso and Gris. Watch out for inappropriate visual material in Dali.

You might also find some books about fractals. These mathematical objects are compelling visually and emotionally. You want to engage your non-reader with powerful visual images. Then, you can help him move on to text, using the neural boost he gets emotionally and neurologically from engaging images in service of less easy-to-read words.

A child only reads comic books. Should I take them away?

If the child only reads comic books, do not worry. Comic books integrate image and text. Show interest in the comic books. Read them with the child. Get him a copy of the comic book, *Einstein for Beginners* by Joseph Schwartz and Michael McGuinness (Pantheon, 1979). Invest in the *Tin-Tin* British series.

Do abused children have special scribbling needs?

Abused children need all of the affectionate help they can get, and the pictures and the words available through this program will help to heal the damage in their heads, hearts and lives.



Michael Sheridan reading to grandsons, Nate and Ben. 2007

And it remains the job of caregivers for sound developmental reasons to teach children to talk, to get along and to be acquainted with text and image as productions on the page, rather than solely on the screen.

Can physically handicapped children do this scribbling and drawing program?

Yes. About ten years ago, I was working with elementary school children in Gill, Massachusetts. One boy was in a wheelchair. He had obvious physical problems, leaning way over to one side. I included him in the Drawing/Writing exercises. I have a slide of the drawing made by this 3rd grader; it's a toy train engine. This slide (plus the information in the story you will read later about Tito, the 16 year old severely autistic boy who can write words), demonstrates that children who appear to be physically and/or mentally disabled can draw and write and think capably --- as their drawings and writings prove clearly, poignantly and powerfully. This is hugely important information about marks-based communication skills, especially for children who may never be able to talk intelligibly.



Dustin, drawing of locomotive, © 1988, Gill Elementary School, with permission from Dustin. Dustin was in third grade when he drew this locomotive. He had cerebral palsy and was in a wheel chair with head support. The locomotive seems to be upside down, but it is right side up from Dustin's point of view, as is the house. Dustin's drawing skills are steady and accurate-impressively so, given his medical situation.

Do autistic children have special scribbling needs?

Yes. It looks like the ability or desire to scribble and draw disappear along with speech at the onset of autism often between the ages of two and three. It also looks like music is a better linkage for autistic children than mark-making. But mark-making may be a major way for some severely autistic children to communicate.

The recuperative powers of mark-making for incomplete or damaged brains remain largely unknown. Only studies with a program like ***Scribbling/Drawing/Writing*** will tell. We do know that it is ***not*** cruel to attach a pencil to a child's hand and to urge that child with all the loving care possible to get that child to write as their one operable mode for communication, as we will learn in Tito's story in "Stories About Mark-Making".

Autistic brains are missing some linkages. But brains grow. We now know that new neurons are created when necessary. (We already knew that new synapses and neural nets are created all the time.) How can autistic brains hook themselves up? It looks like a major problem for autistic

children is attention. In this book, we'll explore how scribbling and drawing can help connect the child's visual system with his attentional system, as well as with his emotional system and his reasoning and speech systems, using marks.

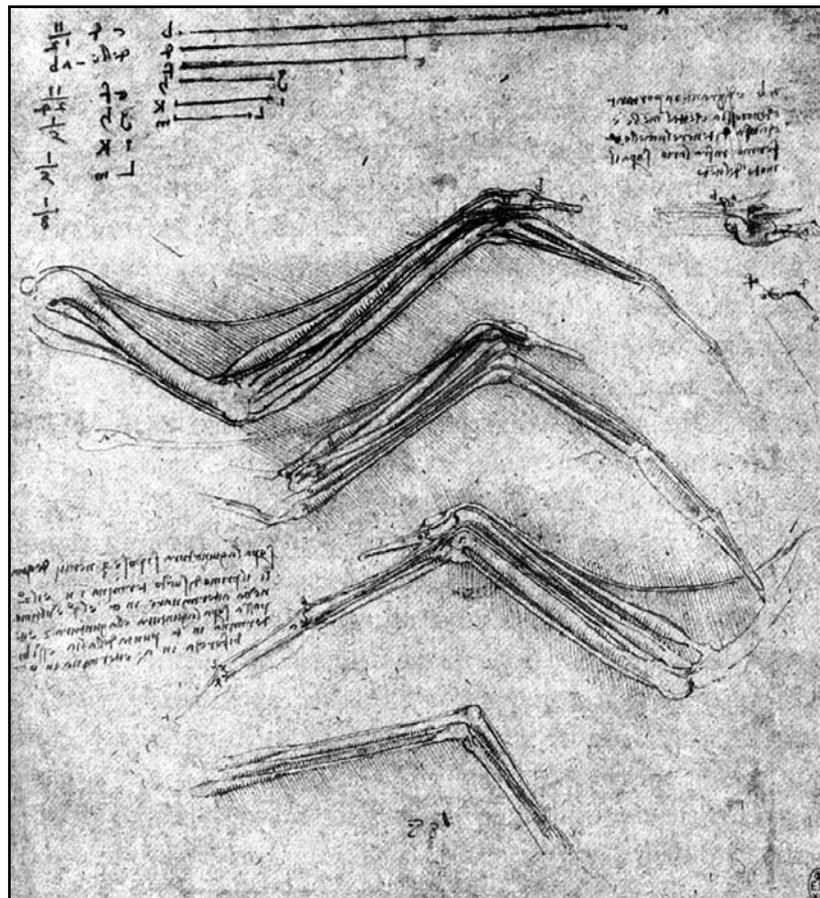
If there is a Mozart effect, why not a "Da Vinci" effect?

The "Mozart effect" once documented in *Science Magazine* in 1993, was later shown to have no effect (*Science* Aug. 1999, Vol. 285 #5429, p. 827) for gains in increased spatial abilities for those who listen to Mozart before a test. Performing music, on the other hand, does increase brain power for language (*The Mozart Effect*, Don Campbell, 1997) and so does listening for the call and response of the composer's music. So why not performing drawing? One of the great verbal minds of all time was a visual artist/inventor who also wrote. Leonardo Da Vinci's journals are living proof of what a balanced bilateral brain looks like - a brain that draws and writes, back and forth, calling to itself.

That kind of bilateral, drawing/writing balance, if not that brilliance, is available to all of us. All we have to do is approach the world with curiosity, learn to draw and get into the habit of writing. The "Mozart Effect" tunes the brain for language learning via synchronous aural exchanges, while what we could call the "Da Vinci/Drawing/Writing Effect" trains the brain in language learning through synchronous visual exchanges between the right and left brain, using drawing marks and writing marks.

THE ABSOLUTE MAN

Bramily, Serge, Leonardo: Discovering the Life of Leonardo da Vinci, Figure on page 285, "Anatomical Study of a Bird's Wing. Royal Library, Winsor." © 1991 reprinted by permission of HarperCollins



Anatomical Study of a Bird's Wing.
ROYAL LIBRARY, WINDSOR
Leonardo da Vinci

Benefits of a scribbling/drawing/writing/talking based program:

- A child with a ***positive emotional outlook*** about life.
- A child who can ***communicate with others*** and the self.
- A child who uses the fun of drawing, writing and reading to learn to ***self-regulate*** her brain emotionally through the positive effect of pleasing and meaningful marks which ***boost the spirit and clarify life***.
- A child who will develop a ***strong, working relationship*** with ***several symbol systems***, enriching the ability of the brain to ***think and to know***.
- A child who has an ***affinity for geometry*** as the language of shapes in space, and, over time, for physics as the language of why and how things happen on scientific, as opposed to, say, poetic levels - which is not to say that the child will not be a poet/scientist in informal, everyday terms.
- A child who ***thinks*** connectedly, and unpredictably, or ***creatively***.
- A child who develops into a ***mature thinker***, capable, not only of logical and of intuitive thought, but, in addition, of heightened, clarified consciousness states, or self-knowledge, including spiritual understanding.

Scribbling/Drawing/Writing: what happens

In the first year or so, your child's scribbles are going to become clear, the way muddy waters clear. A child is going to be able to look at his or her own scribbles and talk about them. These marks are going to carry meaning for your child. In the course of the normal unfolding of a child's life, the child is going to teach himself or herself to write and read marks, starting with scribbles. Why? Because the child's visual cortex is designed to make sense of contrasts between light and dark, to see edges, or the place where one thing stops and another thing begins, like the arm of the sofa or the edge of the stairs. The child's brain has evolved to discover and identify objects like mother's face by extracting outlines and other salient characteristics (including shiny eyes) from the hodge podge of visual information reaching his brains through his eyes. Over the course of the child's life, his visual cortex learns to evaluate and coordinate line and shape and motion and color and distance, even to understand visual paradox and illusion. The child learns to get around in the physical world. This in itself is a huge achievement, which other plants and creatures master, too. But there is more. Amidst all the lines and shapes in the external world, the child learns to discover meaning in his own handmade lines and shapes. Incredibly, the child is going to teach herself to think using marks. The child is going to use dots and lines and spirals and circles to construct special, internal mental objects. These mental objects are the neural architecture of symbolic thought. The child will learn to get around in the world of symbolic ideas.

Chimpanzees will scribble. Monkeys recognize symbols and use sign language. But these primates do not generate, as spontaneous motor behavior, strings and matrices of meaningful marks. That's the difference and may be the only substantive behavioral and neural difference between us and other animals.

Scribbling/Drawing/Writing: skills

Gross and fine-motor skills: Self-trained and calibrated arm-hand-eye-brain coordination, getting the brain ready for speech, reading and writing a range of symbols, or marks of meaning.

Attentional skills: Self-regulated attention through scribbling and drawing. Without the ability to focus and sustain attention, the mind can not learn.

Visual skills: The ability to visualize and imagine and theorize based on careful visual analysis of things in the world as they are, insofar as it is possible to know things as they are through scribbling and drawing.

Emotional skills: Self-regulation of basic emotions achieved through exchanges with an affectionate care-giver, while engaged in brain-pleasing, mark-making activities, learning, in this shared process, to interact empathetically while developing a positive, "can-do" attitude, including confidence in thinking and doing.

Verbal skills: The ability to speak using a growing vocabulary and to recognize and retrieve words (or read and write) across a range of symbol systems, learning to translate across these systems, as well. For instance, drawing a picture and then writing a poem or a story about that picture is an example of translating across symbol systems. Writing a symphony from a poem would be another. Creating an algebraic statement to express the formal relationships in a painting would be another.

Intangible skills: Learning to use marks as magic mirrors for self-reflection, self-clarification, and self-transformation.

The promise to caregivers who spend time with this childhood literacy program:

- A closer, more harmonious environment.
- Children who are mentally prepared to be talkers, readers, writers, communicators, and problem-solvers.

Saving Literacy

- Caregivers and children who are calmer, less irritable and rushed, more centered and grounded, more effective as communicators and decision-makers at home and in the world.
- Caregivers and children who are or will become more literate, invested in a life where reading and writing words and making and appreciating images and other kinds of symbols, are important and meaningful and inspirational aspects of life.

Whether children develop many literacies or a few, the instinct for marks persists, coded in the brain, eye, arm and hand. More than speech, which - as a tendency to vocalize - we share with other sound-producing creatures,¹³ drawing is our determining ability. Drawing is our human language instinct.

Nest-building and meaning-making

Birds build nests. Humans make meaning. Literacy builds meaning with dots and dashes, lines and squiggles the way birds use twigs and leaves and grass and bits of string to make nests to hold their young. Our brains are coded to become the nests for hatching our ideas.

Ever so delicately and skillfully, the beak of the bird picks up a twig; ever so delicately, the fingers of the child hold the pencil to make her first tentative marks of meaning. The child is building her brain. And like some birds with their nests, children are intent on building beautiful brains. Art and music, literature and mathematics are part of that beautiful construction and decoration.¹⁴



*Mathilda, painting age 2,
permission of parents*

Caregiving

Two of the major jobs of caregiving are encouraging children to talk and to be ready to read and write --- if not to actually read and write. Many parents still read to their children and help them learn their numbers and their ABC's. But some do not. This work may fall to the professional caregiver, too.

A third job of caregiving --- as critical as teaching little children to speak and to be ready to read and to write --- is teaching little children how to relate to others, or how to get along with others.

These three jobs --- teaching children to talk, to be ready to be literate and to relate to others ---- fall to mothers and fathers and other primary caregivers of young children. Why

¹³Barbour, Dennis., Wang, Xiaoqin, 2003 "Contrast Tuning in Auditory Cortex, " (how acoustic features in human and mammalian brains are alike in terms of spectral profiles for species - species specific primate vocalizations) *Science*, vol. 299, 14, February pps. 1073-1075.

¹⁴Dissanayake, Ellen, *Homo Aestheticus: where art comes from and why* 1992, 1995, University of Washington Press: Seattle. In addition, Dissanayake's book *Art and Intimacy* supports the critical importance of the dyadic mother/child relationship to the child's ability to achieve intimacy on a variety of levels, including a relationship with art.

downplay the importance of this three-fold work,^{15,16} when it is so important to children's well being and success?

Being literate and socially adept are survival skills in a multi-cultural, multi-literate society. We are surrounded by elaborate visual images, and minimal texts, and subtexts. To protect ourselves from being manipulated by the media and to use the vast data bases at our fingertips, we need to be able to read visual and verbal messages. This means advanced literacy skills. Children will also have to work with many kinds of people and ideas. We all need to be multi-cultural and multi-literate.

There's a big advantage to this program besides affordability; children start scribbling and drawing on their own. You are not going to have to teach toddlers how to embark on this voyage of literacy. They'll teach you!

"The goal of caregiving, education and a well-lived life is using our brains to the fullest."

Special aspects and benefits of the caregiver/child relationship

Especially when it comes to newborns and infants, mothering is special. It's a one-on-one proposition. It's personal and it requires time and energy. Mothers instinctively know how to talk "motherese,"^{17,18} that slower, higher pitched talk that is suited to a baby's brain. Children,

¹⁵Harris, Julia Rich, *The Nurture Assumption: Why Children Turn Out the Way They Do*, 1998, New York: Touchstone Press. *The Nurture Assumption* suggests that the groups to which children belong outside the home as they mature - rather than their parental at-home experience -- form their character. According to Harris, parents -- especially mothers -- do have an early influence on children's ability to form dyads, that is, two-some, close relationships, but the child's useful adaptations for life outside the home are brought out by imitating the groups they belong to. *Saving Literacy* proposes a third environment between home and the outside world identified as the inner environment of the brain. This book also shows dyadic skills can transfer, via training in drawing and writing, to the peer group, allowing the child to self-define against the peer group as well as within it.

¹⁶Bruer, John T., *The Myth of the First Three Years: A New Understanding of Early Brain Development and Lifelong Learning*. 1999. New York: The Free Press. Bruer examines federal policy on early childhood education. He corrects undue emphasis on daycare for infants and education for the very young children, maintaining that the importance of both for adult personality is not that decisive. In fact, Bruer insists that a mother's influence is not all that decisive, either. Bruer's intent is to defuse parents' frantic concerns over their roles and responsibilities. Bruer reassures parents that most daycare providers are adequate, and urges parents to relax and to just keep on doing what they are doing. Bruer dismisses as spurious books for parents which use neurobiological explanations, and he takes issue with intertheoretic, science-based explanations as fanciful and frivolous, specifically targeting the work of E.O. Wilson. Bruer insists that the gap between child development and developmental neurobiology can not be bridged currently. This book strongly disagrees, and proposes some of the neurological keystones for the arches of that bridge.

¹⁷"Motherese" is that slower, higher-pitched, grammatically simpler way Tamil and middle-class American and European mothers speak to little children. Currently, not all cultures use motherese (Goldin-Meadow, 2003). I hypothesize (Sheridan, 2005) that the use of motherese was part of the early dynamic of hominid language development, lost in some cultures who provide sound-based patterning for speech and literacy in other ways.

One authority on how the mind works, including how humans acquire language, describes most advice for parents as "flapdoodle" (Pinker, 2002, page 384). Pinker maintains that mothers' special way of talking with infants (called motherese) doesn't teach children to speak. That's "folklore" (Pinker, 1994, page 39). In addition, parents' attempts to "micromanage" their children's personalities is not only delusional but dumb (Pinker, 2002, page 387.) In addition, Pinker maintains that the arts are biologically useless (Pinker, 1997, page 522). I maintain that motherese -- as setting the attentional/emotional tone for speech and relationships; and parenting as outlined in this book; and art (as downstream development of children's biological instinct to scribble and draw) are integral parts of the psycho-social-neuro-biological unfolding of infants, toddlers and young children (Sheridan 2002, 2004, 2005). Parenting and art have on-going, lifelong psycho-social-neuro-biological effects on children and parents. Research with AD, or adult-directed speech (as opposed to ID, or infant directed speech, or motherese) could be conducted with neonates and infants, as such speech is either live or recorded, to see how much a speech learning program affects language learning in children. If Pinker and Chomsky are right, children's speech will develop normally, simply by overhearing adult conversation that is - without conversational interaction.

¹⁸Trainor, Laurel J., Desjardins, Renée from citation 2002; "Adults with little experience of infants use motherese, too" (Trainor, Desjardins). "The pitch and speech contours of mother's speech attract the infant attentionally and emotionally." (Trainor, Desjardins, 2002).

fathers, and other adults with little experience of infants use "motherese" too; the pitch and speech contours of motherese attract infants attentionally and emotionally so the infant brain not only learns basic structures of language from motherese, but the infant learns that communication and relationships are worthwhile.

Mothers know how to listen and wait for the baby's response and just when to re-enter the conversation. The mother's genius for a call-and-response relationship with an infant is a cornerstone of the child's emotional, verbal, and literate life. The child is brilliant, too, at this emotionally charged, "conversational" interaction.^{5,6,7,14} We have vastly underestimated the abilities of the fetus, the newborn, the infant and the toddler to self-integrate using his sensory systems.¹⁹ Even in fetuses after the 20th week of gestation, hearing has near adult range... and acts as the major organ for timing the integration of other immature systems. In effect, the skin of the fetus acts like a huge ear.²⁰ This self-integration is not only cross-modal; it is intermodal and plurimodal - many systems are involved and they influence each other. There is fluency in this coordination. Babies know the grammar of self-construction. This grammar of self-construction and self-integration using DNA and environmental influences and triggers supports the organization of a language system.

Fetuses and neonates integrate and disintegrate in response to the environment, especially to noise. Because of the connectivity of the brain, that integration or disintegration is global, with normal or abnormal outcomes.

Upon this intimate mother-child relationship --- characterized by exquisitely calibrated, attuned and synchronous exchanges of glance, expression, sound and gesture --- depend at least four aspects of the child's development:

- The child's early neural assemblies for emotional tone and thus for adult emotional tone (life is good, life is bad).
- The child's early neural assemblies for relationships with other human beings and thus for adult relationships with other human beings (I like and feel close to and understand people and I know other people will like and understand me; or I do not like, nor feel close to other people and I know they do not like me nor feel close to me nor understand me).

¹⁹Maret, Stephen, 2003. *The Prenatal Person: Frank Lake's Maternal- Fetal Distress Syndrome*. Lanham, MD:University Press of America.

²⁰Tomatis, A.A., 1963. *L'Oreille et le langage*. Paris: Seuil., 1970 b, "L'integration des langues vivants." Editions Sodontap. 1974 a, b "Vers l'ecoute humaine." Vol. 1, 11, Paris: Les Editions E.S.F. 1991 *The Conscious Ear*. Barrytown, NY: Station Hill Press.

¹⁴Dissanayake, Ellen, *Homo Aestheticus: where art comes from and why* 1992, 1995, University of Washington Press: Seattle. In addition, Dissanayake's book *Art and Intimacy* supports the critical importance of the dyadic mother/child relationship to the child's ability to achieve intimacy on a variety of levels, including a relationship with art.

⁷Sheridan, S.R. 2005 "A Theory of Marks and Mind: the effect of notional systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children," *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable at www.drawingwriting.com by permission by Elsevier. Hypertext link to *Medical Hypotheses* ScienceDirect Page att: <http://www.sciencedirect.com/science/journal/03069877>.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁶Sheridan, S.R. 2004 "Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness," *Toward a Science of Consciousness*, Tucson, abstract #209.

- The child's early neural assemblies for relationships with images, words, and text of all kinds, and thus for adult relationships with abstract symbols (I can think using images, words, numbers, notes; or I can not think using these internal mental objects. That is, I will be functionally literate; or I will not be functionally literate as an adult).
- The child's early neural assemblies for relationship with the self and thus for adult self-image (I like myself and my brain likes to think and can sustain thought to make meaning of my own life; or I do not like myself and my brain is incapable of the sustained thought necessary to figuring out the meaning of my own life at the critical points when making sense of my life would be hugely useful to me). Caregivers can provide and/or reinforce the closeness, the love, the respect of the mother/child relationship.

Schools are in a pickle

Children are expected to be reading-and-writing-ready when they come to school, in the same way that they are expected to be potty trained. Even if expectations for reading and writing are beyond some children's developmental abilities, caregivers need to work with these expectations.

Are children changing?

Are parenting and nursery schools and preschools and early education changing? Or are children changing?

Educational statistics

Educational statistics, as well as teachers' classroom experience, report that attention deficits, learning disabilities, delays with speech, and motoric and cognitive problems with writing and reading continue to rise as much as 13% per year! There's a new acronym: EDD, or empathy deficit disorder. One out of every 91 (2009) children is diagnosed with autistic spectrum disorder. What does this mean? Are diagnoses earlier and more sensitive? Or, are children changing? Is parenting changing? Toward the end of this book (*Where do we go from Here?* and *Toward a Peaceable Kingdom*), we'll address some of these issues.



Ben, at age 2, photo, the author

*Stories About Mark-making***Stories**

Josef



Parker



Robbie



Evan



Anonymous



Sarah



Wesley



Maeve



Sam



William

The opportunities we are given as children can have a profound effect on our lives. When it comes to the arts, of course, there are financial considerations for parents-not every family can afford piano lessons for children. But all children can have a pencil and a pad of paper. This is one of the many great things about drawing and scribbling; the materials are simple and inexpensive.

When children are first given these tools, some will scribble and then progress to the stages of Early and Middle Drawing described later in this book. Others will progress, even at a very young age, to Mature or High Drawing, assimilating the “tricks of the trade” - perspective, shading, the emotional use of line and color, composition - through observation and practice or through instruction. Some children will continue to draw throughout elementary and high school. Other children will begin to focus on writing. Some will do both.

In my experience, boys, more than girls, draw through childhood and adolescence, often producing images of heroes and monsters and weapons and worlds in stunning, if formulaic drawings, using models from adventure comics.

As a college studio arts teacher, I’ve worked with young women who drew in childhood and were still drawing in adulthood. I was such a young woman, myself. But most elementary and high school girls do not draw as much as boys do. Is this cultural? Is this educational? Is this a testosterone/estrogen, hormonal, gender-driven difference?

When schools include drawing for all children, the way schools include writing, it may be possible to tease out gender-based differences for drawing and writing. An article in *Science*

magazine suggests that women writers use language in identifiably different ways from men writers (“Your Words Betray You,” describes the research of computer scientist Sholom Argamon, Bar-Ilan University, Ramat Gan, Israel, Vol 300, April 25, 2003). Whether women draw differently from men in gender-specific ways has not been determined.

Certain images do recur in female artists’ work - ovals, for instance. But the almond-shaped mandorla has been a standard shape used by male artists to enclose a male god.

If you were an art history expert, you might be able to identify the work of Artemesia Gentileschi as female, while identifying the work of Peter Paul Rubens as male. But, apart

There is not yet enough substantive research to make training in drawing part of the basics from kindergarten through college. But an appreciation for the range of cognitive benefits provided by training in drawing throughout the educational experience will become evident with the brain research urged by this book.

from subject matter, focusing on technique alone - how the paint is applied, the brush is held, color is used, form is defined, line is executed - could we say for sure? Isn't talent gender-free?

Until all little boys and girls receive equal training and support for drawing and writing, we can base our speculations about gender and visual or verbal talent on children’s actual drawings and writings, as well as on our observations of ourselves as male mark-makers or as female mark-makers. It is probable that genetic temperamental “humours” color our drawing and writing, as much as gender; we may be shy mark-makers or aggressive mark-makers; we may be deliberate mark-makers or impulsive mark-makers; we may be sad mark-makers or happy mark-makers. If we define temperament as emotional tone using Panksepp’s basic repertoire (1998) we’ll expect to see the following temperaments in children: those who tend to panic; those who get afraid easily; those who rage easily; and those who tend to be curious and hopeful, loving and playful. Equal training and support for both boys and girls in drawing and writing should allow authentic gender-based differences in children’s mark-making to emerge. More importantly, equal training and support for drawing and writing should help children work with their special temperaments, guided by marks of meaning.



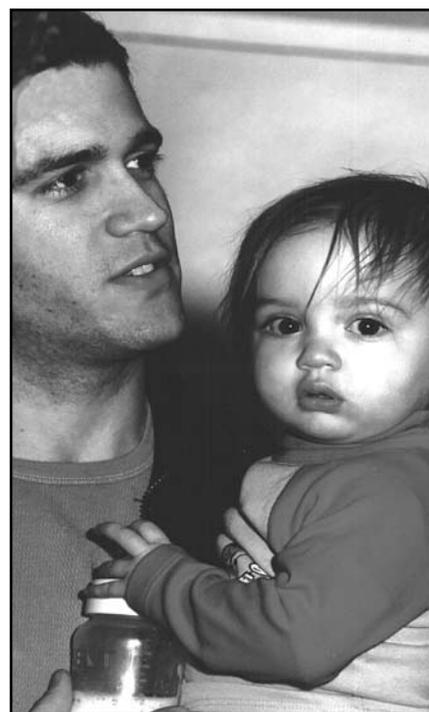
Will Hannay, age one © 2005 Deborah Hannay, Reprinted with permission of Deborah and Peter Hannay

To become active, a gene must be expressed. “Expressed” means mobilized, called into action, given a chance to operate. When we encourage a child to scribble and draw, the gene for symbolic thinking (if such a gene exists) is “expressed.” When we encourage a child to talk about his drawing or agree with him that his wavy lines are writing, we’re helping express the genes for speech as well as for writing. Whether or not there are genes for special kinds of mark-making, one thing is sure: if we isolate the brain of the child from images and words, we isolate that child from language.

I am not a geneticist. But I know three things from a lifetime of observation: the unfolding of the life of very young children includes three extraordinary events, events which do not occur as a robust, developmental triad in the young of other species: laughter, scribbles, and metaphor. (Young rats may “laugh” when tickled in the midst of rough-and-tumble play - dogs, ditto; but, according to research, rats don’t emit such high-pitched squeaks - or in the case of dogs, “laugh-pants” - in other situations.)

Let’s examine this description of the physical, emotional and mental unfolding of the human child from pre-birth to age four or five, “bolding” the items of special interest to a theory and practice of mark-making. Children will move through this progression differently.

- Squirming and wriggling and kicking *inside* the womb
- Squirming and wriggling and kicking *outside* the womb
- Exhibiting the Moro reflex: grasping with fingers and toes. Startling to sudden sounds. Rooting and sucking.
- Looking; starting to use the eyes to know
- Reaching and grasping; starting to use the hands to know
- Using the hands to put things in the mouth: continuing to use the hands, eyes, and mouth to know
- Rolling over
- **Belly laughter at about 2-3 months of age, probably on recognizing mother’s face in the middle of the night**
- Sitting up
- Crawling



Panio and Mathilda © Panio Gianopoulos



Will Hannay, age three © 2007, photo by author.

- Picking up minutiae and examining everything scrupulously with mouth, eyes, fingers.
- Reading/looking at pictures in books.
- Toddling
- **Scribbling**
- Walking, Running
- **Reading scribbles/looking at scribbles**
- Talking
- **Reading/talking about scribbles**
- **Drawing**

- Reading/looking at drawing
- **Reading/talking about drawing**
- Talking about pictures and books
- **Reading pictures in books**
- **Producing proto-mathematical, musical, and text-based marks**
- **Reading one's own proto-mathematical, musical, and text-based marks (invented spelling)**
- **Inventing verbal simile and metaphor in everyday speech.**
- Reading other people's words in books

A baby who is active inside and outside the uterus is healthy. Babies are not designed to be passive. A “couch potato” is a physical type created by visual technology. Television and computer watching also encourage hyperactivity, perhaps as a reaction to long periods of physical inactivity. Compelling visual technology may modify humans genetically so that fetuses and infants, babies and children are unusually active or inactive inside the uterus and outside the uterus. Nature and culture co-evolve. Research with male bird song²¹ shows how quickly inherited traits change - within seasons and generations. (For more about the influence of the environment on genetics,

²¹Barinaga, Marcia. 2003 *Newborn Neurons Search for Meaning* (song nuclei in male song birds), *Science*, Jan. 2, vol. 299, pps. 32-34.

see in Acknowledgements, West-Eberhard, 2003). We are seeing, if anything, an increase in physical hyperactivity and a decrease in the ability to pay sustained attention in children in a technology/electronics permeated culture.

I grew up painting and writing. By the time I reached college, I'd established a rhythm: I painted half the year and I wrote the other half. Long before I ever heard the term "balanced bilateral brain," I was trying to build one.

What's so significant about balanced bilateralism? It's elegantly simple: we have two sides to our brains. Over evolutionary time, one side of our brain evolved to work with spatial relations, including images, the other side evolved to work with language, including words. Brain research clarifies the fact that each side of the brain receives input from the opposite hemisphere. The right hemisphere needs the left hemisphere and the left hemisphere needs the right hemisphere to take full advantage of visual and verbal thinking, able to name a visual image as well as to illustrate a word.

Being a balanced bilateral thinker is natural - and it's relatively easy. After all, the first requirement is already fulfilled. Most of us have intact brains with two hemispheres. One hemisphere has not been severed from the other. (Doctors resort to hemispherectomies in cases of severe epilepsy to protect one side of the brain from severe electrical storms generated in the other.)

This means that all of us, at birth, have brains that - at least in gross structures and processes - look alike and work alike. Whether we are males or females, whatever our race or socio-economic class or educational level, we're equipped from birth to be visual thinkers and verbal thinkers. And we're meant to parent/caregive in this way, too: bilaterally.

To encourage spatial thinking and linguistic thinking in our children, we need to understand that children's art is another term for literacy. We need to understand that numbers and notes and words are part of literacy. We need to remember that finger painting with food on the highchair tray is where multiple literacies begin.

Male and female, adult and child, we've got two-sided brains and these brains are designed to become a unity. Our brains are meant to integrate themselves, stabilizing various capabilities in relation to others, including the ability to see, the ability to act and communicate and the ability to feel.

At a conference on consciousness in Sweden in 2001, I saw a brain scan of a newborn. More clearly than a textbook, that single image clarified the developmental integration of the child's brain. The mid-to-back part of the brain of the newborn is the only area lit up. Only this section is metabolizing glucose. None of the front parts of the brain are, as yet, lit up. None of the pre-frontal or frontal lobes are functioning, nor are the parietal lobes on the sides of the brain. We think of these areas - the frontal lobes in particular - as what make us especially human, as thinkers. Well, the frontal lobes do not make us especially human as thinkers when we are newborns.

An infant's operational areas include:

- The visual cortex at the back of the brain. (The visual cortex is also described as the occipital lobes.)

Saving Literacy

- Emotional survival circuitry attached to the brain stem, in an area once associated exclusively with autonomic functions, rather than with emotions.

The newborn's brain is mobilizing what's strictly necessary: blood pressure, breathing, heart rate, emotional cues for hunger and physical distress, and the eyes, the already searching eyes.

The infant's visual world is a jumble of amorphous lights and darks. But the infant's visual cortex is equipped with neurons designed to fire for lights and darks of many values, for lines at many angles, for minute perturbations of motion, for the subtlest hues of color. His brain is ready to start fine-tuning its visual perceptions immediately - starting with light/dark contrast, including edges. (As we age, this is exactly what we lose; visual and aural range of discrimination, and the selectivity that goes with such a range).²²

If a newborn kitten's eyes are sewn shut, its visual cortex does not receive the stimulation of light. Later, when the stitches are removed, the kitten staggers around. Even though its eyes are open, the kitten is blind. So, there's a catch to this mental readiness of the infant to learn to understand the world through sight. To learn to discriminate degrees of line, shape, motion, and color, the infant's visual cortex must have practice with lines, shapes, motions, and colors. Parents instinctively know that infants' visual cortices need stimulation. That's why they hang colorful mobiles over bassinets, that's why moms instinctively bring their faces twelve to fourteen inches away from their babies

when they interact with them. This is the natural "in-arms" distance between the face of the nursing mother and the eyes of the infant.

Imagine being teleported into a world where nothing is familiar, where everything is totally and completely strange - in fact, unintelligible. Imagine how it would feel if you could not even begin to figure out anything in this strange world. What if you had no words, and no images to help you identify these phenomena? You would be terror-stricken. Infants are not terror-stricken because they do not know enough to be terror-stricken. They know just enough to get the care they need and they know just enough to use their eyes to start to figure out the world, baby-step by baby-step.

How do laughter, mark-making and metaphor operate in the developmental process? Why are these three items neurobiological requirements for human brains?

We all know - even if we do not recognize it as such - the precise moment when the baby's brain gets it all together for the first time. By "getting it together", I mean being able to recognize something and know something, using the eyes. Somehow, a baby figures out a face. When a two month-old laughs with uproarious delight at his Mom's face, the baby has made a mental hyper-leap. Recognition! What a feat for the brain of the child!

²²Hua, T., Li X, He L., Zhou Y., Wang Y., Levanthal AG. 2005. "Functional degradation of visual cortical cells in old cats." *Neurobiology of Aging*, Elsevier Press: UK.

Whether programmed within the deep genetic and neural potentials of the brain, or not, the ability to put the lines, shapes, and shiny bits together as “Mom’s face” is incredible. Even rudimentary organisms have light-sensitive tissue to direct behavior. But the amazing thing about human infant recognition of Mom is twofold:

- One, it happens,
- Two, the baby finds it *funny*.

The baby finds Mom’s face hilarious. It isn’t that Mom’s face itself is funny. It is probable that the sensation of being able to recognize something - suddenly, startlingly - is wonderfully funny. Whether we analyze humor as part surprise, part negated paradox (Whoa, I thought Mom was not there, but, wow, Mom is here after all!), or part of the thrill of confidence we experience when we “get” something (as in understanding something), the infant’s first experience of recognition is expressed emotionally in a very positive manner. This positive experience can carry over into a lifetime of being surprised at what is startling and new, greeting change with a shock of intense delight - rather than, say, greeting the new with fear and suspicion. That’s part of what joy is about, along with other altered states of consciousness: delight at the newness of things, or the re-newed-ness of things.

Positive emotions in others triggers positive emotional responses in us. We laugh out loud at our baby’s belly laugh. Such shared delight between mother and child, between father and child has deep emotional resonance and consequence. Mutual delight builds strong neurochemical bonds.

Consider the deer: it grazes in a meadow which includes a few young trees; you arrive in its field of vision, downwind. The deer smells no danger, and, once you stop moving, sees no danger. You’ve become a sapling. Vision and emotion are integrated in specific ways in deer. If an item in the visual field does not fulfill “danger” requirements, it is nothing for the deer to worry about. She can go back to grazing. She does not worry about whether a sapling might turn into a hunter. She does not worry about the environmental impact of the buds it is eating and her fawns do not laugh as they bound after the white flag of her tail.

A human two month-old’s laugh of recognition tells us we are seen. We are known. We exist. The baby tells us so. In turn, our laughter tells the baby that she is seen, she is known, she exists. It is my belief that once a baby starts to scribble, the baby is taking over for herself the ability to see herself, know and love herself, to be herself and that this seeing and knowing and loving and being are designed by neuro-evolution to be infused with strong positive emotion. Integration of the visual cortex, the motor cortex and the emotional cortex begins with the mother, and laughter. Sheer delight is, apparently, a neurological requirement for early, successful integration.

Like laughter, scribbling is, for most of us, apparently uncalled for. We might call infant laughter and toddlers’ scribbles gratuitous behavior. Both come “for free.” We don’t teach our toddlers to scribble. No nursery schools, pre-schools, kindergartens, elementary schools, middle schools, high schools or colleges list scribbling as a requirement. Still, the fact is, toddlers scribble. Adults doodle. Neurologically, scribbling must be a requirement. Maybe, so is doodling. (Personally I use doodling to self-comfort in boring or troubling situations.) Because scribbling is so visual, and so positive emotionally, and so motoric, involving the whole arm of the child, it must be part

This book is about learning emotional self-control through marks of meaning. It is about a good deal more, but this is a big part of the message.

of the child's body/mind integrative work. This triad - vision, emotion, action - operates integratively at birth. How we feel, how we see and how we act continue to be connected. How we feel, see and act as we use marks of meaning continue to be connected, too. Our entire sensory apparatus connect with how we feel and act. Seeing, hearing, tasting, touching, smelling and emotion and action, including the action called mark-making, influence each other. The five senses, perception and action are meant to work as a unity.²³

We learn to feel from how we see and we learn to see from how we feel. If we see the world as a dark and scary place, we feel that the world is a dark and scary place. If we feel the world is a dark and scary place, our drawings and writings will reflect this point of view. Mark-making is part of how we see and feel. Art therapists know that the child who draws dark and scary and lonely drawings is feeling dark and scared and lonely. Drawing is a routine diagnostic tool in child psychology. Teachers deduce that children who cannot form numbers and letters skillfully are "dysgraphic," and, if they cannot write and read easily, they are "dyslexic." The prefix "dys" means "having trouble with," or "not." Additionally, educational professionals use drawing and other spatial tasks as routine assessment tools for cognitive skills. How we think about marks and how we make marks matter when it comes to evaluating brain function.

Human babies are born with some instincts: to grab hold with hands and feet if they think they are falling, to root for the breast, to suck. But mostly, babies have to figure things out using their mouths, hands, and eyes. Babies may inherit atavistic visual cues about what is safe, nutritious, and pleasing, but mostly babies learn about what is safe, nutritious, and pleasing from parents, society and their own mistakes. Then, our little visual learners show their independence from caregivers and society in two ways: they say "No!" and they scribble. These little people are going to be able to see, feel, talk, think for themselves. Marks of meaning can be - will be - an important part of this independent thought and action.

In the rest of this section, we'll see how some specific children use marks. We'll look at: two scribblers, aged one and two; a three year-old who draws the "R" train in plan and elevation; a four year-old who scribbles like an abstract expressionist; a four year-old who uses drawing to help him speak; a five year-old who's been drawing, painting and sculpting since she was a year old; a seven year-old non-reader, uninterested in scribbling or drawing; a three year-old who invented metaphor and grew up to be a painter and a writer; an autistic child who stopped scribbling and speaking at about one and one-half years of age.

²³ Berthoz, Alain, 2003. *The Brain's Sense of Movement*. Cambridge, MA: Harvard University Press.



JOSEF:
Marks, sustained attention, and emotional self-regulation

Nine years ago, a little boy came to my farmhouse in Maine for supper. Josef was one and one-half years old. As you can see from the photo, he was “all eyes.” I had known his grandmother, Jean, for thirty years, and his mother, Starr, for ten or so.

At one and one-half years of age, Josef was not talking, and, as it turned out, he was still not talking a year and one-half later. His parents and grandparents did a lot of interpreting for him. (By three and one-half years of age, Josef was talking a blue streak. His initial “s’s” were missing. For instance, he called the hose sprayer gadget on the sink a “prayer ‘ting.’”)

When Jean and Starr arrived at my house with Josef, Josef took one look at me (he’d seen me before) and burst into tears. Starr carried him out on the porch and talked to him quietly. They tried it again. More tears. Another try. Tears. Out again, in again.

His mother, grandmother and I wondered what to do. Should Starr take Josef home? As much as we three women wanted to have supper together, it didn’t seem fair to Josef. Then I had an idea. I got a pencil and a little pad of stickies. I handed Josef the pencil and held the pad just under the tip of the pencil. Josef brought the pencil in contact with the paper, then moved it back and forth, tentatively, while he looked at my face.



Scribble drawing #1 by Josef Guptill, age 1.5 ©2000, Starr and Ira Guptill. Reprinted by permission of Starr and Ira Guptill.



Josef Guptill, age one and one-half, with Jean his grandmother, photo by author, 2000

At the moment the pencil touched the pad, Josef stopped crying. A sudden, giddy smile broke across his face. Scribbling calmed him in an instant. He stopped crying! We were elated. Later, sitting on his mother's lap, Josef continued to scribble. This time, instead of watching me, he watched his marks. And his marks took a very different form.

Josef began to loop his lines, nesting them like feathers on the wings of a bird. Then he dragged a line way out, making a long tail. The range of marks Josef produced at this age, on such a small, precise scale is pretty amazing. As you work with your own children, you will see the same kind of amazing things. You cannot predict exactly how or what a child will scribble. You can only predict that the child will scribble.

When he was two, Josef liked to make marks on his toys, not on paper, using red markers. As Jean said, "Red was his color." At the age of three, he

began talking. Until then, Jean said, when Josef scribbled, he was "just making marks, with no input."

At almost four years of age, Josef "never shut up." He was still scribbling, too, using "lots of circles." As he scribbled, Josef told stories of "going to the duck pond with his mother" or "playing on the slide with his mother." He talked enthusiastically as he scribbled, confident and engaged. Josef has a little brother named Nicholas who, at two and one half, also scribbled. Nicholas's marks "went straight up in the air," Jean reported. "While Joe is circling and talking,

Nick does his little chatter, bobbing his head while he makes his straight-up marks."

Jean asked me, "You remember how Josef was? When I took him shopping, if people spoke to him, he would put his head down, and his hands up, leaning against me. If people made eye contact, he would whip his head around and hide. He's come a long way. When he meets new people, now, he doesn't try to hide. He is more congenial." Learning to get along with people takes time. When Josef was just one and a half, a pencil and a stickie pad helped him to deal with a near-stranger in an unfamiliar house. ***If marks can be used to help little children calm down and make contact with other human beings, this is extremely important information for caregivers of the very young.***



Scribble drawing#2 by Josef Guptill, © 2000, Starr and Ira Guptill. Reprinted by permission of Starr and Ira Guptill



PARKER:
Marks and showing what the child knows



Title of the scribble is "This is the baby. Do you see it?" Scribble drawing by Parker Phillips Allen, ©2000. Reprinted by permission of his parents, Nikki and Christopher Allen.

Another little boy, Parker Phillips Allen, at age two and one-half, sent a scribble to his aunt who was expecting a baby. Parker's father is a photographer, musician and a film scene locator; Nikki, his mother is a dedicated, home schooling parent. Nikki encourages Parker's drawing and notes down his descriptions as captions.

After completing the scribble shown on this page, Parker said to his mother, "This is the baby. Do you see it?"

Psychologists and art historians talk about children's (as well as Eskimo and Australian aboriginal) "x-ray drawings." These x-ray drawings show items that can not be seen - like the legs of paddlers obscured by the sides of a canoe or fish inside a crocodile's belly - items that artists insist on including in their pictures. Such drawings are also called "conceptual;" they show what the artist knows to be true, not just what the artist can see. Although Parker's scribble may seem non-representational to us,

to Parker it stands for "baby in tummy." We know this fact because Parker could tell this to his mother. Thus the drawing is a conceptual, x-ray drawing, a sophisticated production for a two and one-half year old.

In Antoine de Saint-Exupéry's book *The Little Prince*, the narrator, a pilot who has crashed in the desert, remembers drawing when he was a child. Here is "Drawing Number One:"



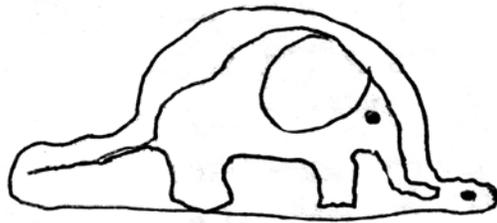
Drawing Number One, version by author

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Sainte-Exupéry writes, "I showed my masterpiece to grown-ups and asked them whether the drawing frightened them. But they answered, 'Frightened? Why should anyone be frightened by a hat?'

"My drawing was not a picture of a hat. It was a picture of a boa constrictor digesting an elephant. But since the grown-ups were not able to understand it, I made another drawing: I drew the inside of the boa constrictor, so that the grown-ups could see it more clearly."

"My Drawing Number Two looked like this: The grown-ups' response, this time, was to advise me to lay aside my drawings of boa constrictors, whether from the inside or the outside and devote myself instead to geography, history, arithmetic and grammar. That is why, at the age of six, I gave up what might have been a magnificent career as a painter. I had been disheartened by the failure of my Drawing Number One and my Drawing Number Two. Grown-ups never understand anything by themselves and it is tiresome for children to be always and forever explaining things to them" (*Sainte-Exupéry*, 1945, p. 6).



Drawing Number Two, version by author

As adults, whether we are caregivers or teachers or acquaintances, we must listen to what children tell us about their drawings. We must take care not to discourage children by giving them the idea their drawings are inadequate or that their stories do not make sense. Discouragement about meaning-making in childhood has very long arms. And we must remind ourselves that just as Parker's scribbles represented something known and unseen (literally unseeable for anyone outside a pregnant mother's tummy, barring an ultrasound image), marks of meaning will be the only way Parker or any of the rest of us is going to be able to make invisible thoughts visible to others or to ourselves!

In the article "The Scribble Hypothesis: Invisible Brain Building," published in the international home-schooling magazine, *Life Learning*, 2002, I emphasized the importance of scribbling as a developmental milestone in children's lives, suggesting that among the most important things caregivers can do is to take children's scribbles seriously. I concluded, "All of our brains are programmed to make marks of meaning. That's what art is, what literature and writing and mathematics are: marks of meaning. And it all starts with scribbling."

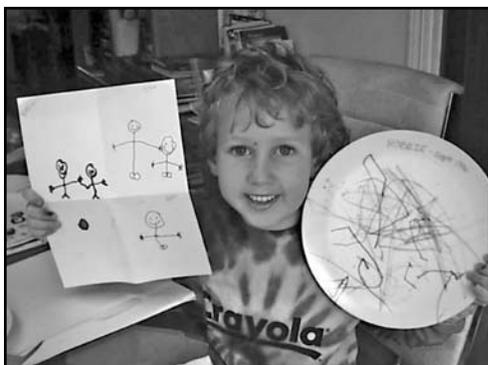
A home-schooling mother read the article and responded: "My seven year-old has never been one to pick up a pencil, marker, crayon, paints on his own... How has not having done much scribbling, drawing, and writing at a young age affected his development? Can he catch up with proper intervention or did he lose out permanently? What can I do as a homeschooling parent that can encourage (not force) drawing, writing and other art activities?" Robbie's story follows.

**ROBBIE**

On October 7th, 2002, I drove to the Koross/Liebowitz house in Newton, MA, about two hours from my house in Amherst. I brought my Drawing/Writing objects, markers, paper, and my interest in Robbie and his mother, Michelle. She had gathered up a few examples of Robbie's scribbling and drawing work since age 15 months: two scribble plates (one from age 15 months, one from age 4 years), a birthday card done for his grandpa (Oct. 2002), a picture of himself singing at religious camp (July 2002), a t-shirt done at a birthday party (Oct. 2002), and a fish drawn in a homeschooling art program (October 2002).

Robbie and I spent quite a lot of time talking about the t-shirt he had drawn. He told me that he and his friends had started a club and that "We were making up these things... a pretend lab, with two machines on top, higher in the air, with invisible supports... one's bigger. They do the same thing. They change the color of your skin. You can pick your color. This is useful because if you are painted all colors and you are arrested for stealing a diamond, then the people arresting you would all fall down laughing and this would make the arrest easier." Then, Robbie talked about the rectangles on the t-shirt. He said, "You push a button on the side of the box and go into a chamber (in the sense of putting something into the chamber). Someone pulls a lever on the outside and the dots disappear and change the colors (of the thing inside the box). The one on the left works for smaller things and the one on the right can be expanded and used to change the color of a car." Robbie said that the figures in the middle of the t-shirt show him and his friends. Robbie is in the middle and the friends on each side are working in the distance. "That is why they are smaller and higher." At the bottom of the shirt is a machine on a cart to wheel it around because it is "so heavy." The machines make other machines. The large rectangle around the drawing on the t-shirt is the room, or the main part of the lab: the floor, walls, and ceiling.

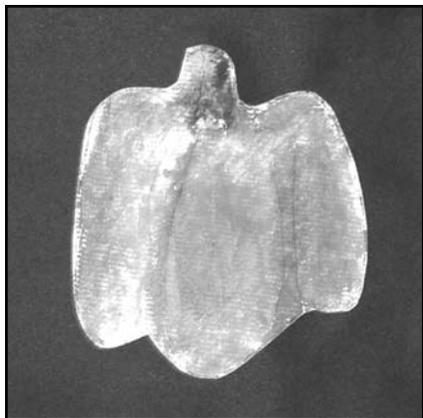
It was clear to me from Robbie's conversation that he knew some of the conventions of



Robbie's scribble plates. Author's photo used by permission of his mother Michelle Koross.

drawing, including how to show objects closer and farther away. Despite scant exposure to drawing and art, Robbie was visually literate. Robbie had a lot to say (or to "read") about his t-shirt drawing of a "pretend lab."

After five hours with Robbie and his mother, both of them were more relaxed about drawing. Before she read my article, Michelle had not really thought about drawing as a substantive mental activity. She'd called it "arty." Now, Michelle experienced, first-hand, the importance of drawing as a mental activity for children, while her son Robbie was realizing that



Robbie Red Pepper, photo used by permission of his mother Michelle Koross.

he could actually do it. Robbie and I spent about twenty minutes on the drawing called LMD, Light/Medium/Dark, working with values and the illusion of three dimensions. Ten days later, Robbie drew a red pepper. Note the dramatic change from stick figures. Note the “fully rendered,” three dimensional, “shaded” drawing. What growth! While his reluctance to write still occasionally worries his mother, she believes that Robbie’s confident drawing skills will, with time, spill over into his writing skills.

As for his father, he wrote, “Seeing Robbie’s recent drawings -- the tee shirt that demonstrated perspective and the red pepper that showed a sensitivity to subtlety and fine motor control -- was encouraging. I could see Robbie had artistic and dexterity skills well beyond any he had previously demonstrated. Robbie has already demonstrated a strong sense of mechanical intuition, being able to explain how simple machines work, to invent them himself and to dismantle mechanical assemblies. To me, trained in physics and the humanities, I see Robbie’s drawing skills, married with his mechanical intuition, making ... a career as a mechanical engineer. In this field, one needs to have an innate grasp of how things work as well as the ability to communicate ideas visually. (Seeing) Robbie (as a future) mechanical engineer is a way of expressing in shorthand the possibilities that a wide range of talents opens up for him.”

Drawing skills are helping both of Robbie’s parents see him in a new light as a capable thinker, not just as a non-reader. Drawing is helping Robbie see himself in a new light, too, as someone who can draw, after all. Robbie’s parents appreciate drawing as part of writing and reading and even engineering. Perhaps Robbie does, too.

No matter what, he’s gained a grace period for growth.

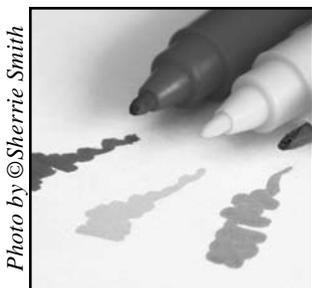


Photo by ©Sherrie Smith

***ANONYMOUS CHILD:
Mark-making and the generation of words as speech***

Another home schooling mother (who prefers to be anonymous) read the Jan. 2003 article in *Life Learning* about Robbie. She e-mailed me in response to the article. “I wanted to share something interesting with you. The youngest of my three children, a boy who is now 4, had a significant speech delay and still has difficulty with proper pronunciation as well as a difficulty with word retrieval. This was especially surprising to us given that our other children, a boy and a girl, were early talkers with giant vocabularies, both receptive and expressive. Now what’s interesting about this is that our youngest son loves to draw and he uses drawing to express the

things he cannot say. Further, when he is actually drawing, he is more easily able to ‘retrieve’ the words he wants to say. In other words (no pun), he talks fluently while drawing.

"Now I think this is interesting with regard to your work, that drawing is helping children with speech disorders (who often end up having other reading and learning disorders as well). I would love to know if you have any information on this subject. My experience is strictly personal."

In a second e-mail, this mother wrote, "[My son] is really such an interesting child, so bright but inarticulate. As I mentioned, his older brother and sister are extremely verbal and have large vocabularies, yet even so [my youngest son] sometimes knows the definition of a word that his siblings do not! Also, I've kept a thick notebook of his drawings over the years. Before he was even two, he was drawing faces with two eyes, a nose and a mouth."

On Friday, January 17th, 2003, this mother added this information: "My oldest son, now 8, is dyslexic and still struggling with reading. He did not do much scribbling as a very young child (unlike his brother) but when he turned five, his drawing came full-blown! I still have the drawing he did of a jungle scene with all kinds of trees and animals, including an anteater eating ants, a cheetah, and a lion. [This older son] hasn't stopped drawing since. In fact, most of last year the main thing I did for home schooling was to read great literature to him and his younger sister while they drew and painted."

Reading great literature aloud while children draw has gained support in language arts curricula.²⁴ This home schooling mother has hit on a powerful educational practice. Tim Rollins, an inner city special ed. teacher turned art teacher, pioneered this method so successfully that the art work produced by his "kids of survival" while listening to great works of literature like Aristophanes' "The Frogs," was published in a book *Amerika: Tim Rollins and K.O.S., or Kids of Survival*, 1989 and became part of the permanent collection at the Whitney Art Museum in New York City.

A child does not have to scribble and draw to learn to talk. A child learns to talk by listening to and talking with other people. But there must be something important about scribbling and drawing for normal speech, as well as for the mental skills we call reading and writing, or we would not see gains in speech, too, when children scribble and draw. There must be generative and constructive and remedial brain benefits behind the child's instinct to make marks of meaning in connection with language-learning in general.

The Learning Disabilities Resource Community provides ten tips for how to help a child develop better speech and language skills. Drawing is mentioned once, as number 10, in the context of encouraging self-esteem: "When a child has a delay of any kind, parents often focus on this and downplay the child's other strong qualities. Don't make this mistake. If your child is good at drawing, encourage it. If he is a sweet child, tries hard, or shares well with others, praise him for these things."

Drawing is more than sweet behavior. Drawing is a neural organizer. We can infer the possibilities for prevention and correction from research in speech therapy and we can extrapolate it directly from some of the literature in child psychology, art education, early education,

²⁴ Short, Kathy, Kauffman, Gloria, Kahn, Leslie H. 2000 "I just need to draw: Responding to literature across multiple sign systems." *The Reading Teacher*, October, pp. 160-171.

Saving Literacy

the neurobiology of vision and attention, as well as from a homeschooling mother's direct observations.

While there is some research around drawing and remediation, the idea of training the child to draw as an alternative to speech or writing as a transitional strategy, or, in some cases, as with the seventeen year-old autistic boy you'll meet in this section, as a final strategy receives strong support in this book. There is not yet enough substantive research to make training in drawing part of the basics from kindergarten through college. But an appreciation for the range of cognitive benefits provided by training in drawing throughout the educational experience will become evident with the brain research urged by this book.

Caregivers and children who work with this literacy program can provide data for the necessary research on the power of training in drawing as a part of the educational experience.

Will scribbling and drawing hurt your child? Not anymore than rolling over, sitting up, crawling, toddling or talking damages your child. Drawing is part of your child's normal development. Your shared experiences with Scribbling/Drawing/Writing will provide support for a practical synthesis between pediatrics, child psychology, linguistics, art education, early education, special and regular education, and language arts education. Who needs this synthesis? Your children.

Let me make a few points in response to the first four stories:

- Children's drawings provide neuro-feedback useful to calming down - through a change in attention and mood. Drawings are also products of the SEEKING system, achieving satisfaction, resolution and homeostatic brain states.
- Scribbling and drawing are part of a natural mark-making progression that helps the child's brain prevent, remediate and/or compensate for speech delays and deficits as well as other potential or actual learning deficits connected with attention and abstract symbolic codes like reading and writing. Marks give children something to think about and talk about.



SARAH:
*Mark-making and seeing the world as it appears
to the viewer*

Karen Whitney was my student in art survey courses at Westfield State College. She was an older learner. Head injuries from childhood resulted in learning disabilities. Her drawing skills were intact; her writing skills were not. Because I gave equal credit for drawing in my art survey course, Karen was able to succeed.

Through dogged determination, Karen now has her BA in Art Education and a Masters in Reading. She is devoted to children, among them her niece, Sarah, who was five years old at



Sarah, ready to paint

the time this book began. Sarah spent 3 to 4 hours per week painting and sculpting in Karen's studio in a converted mill. Karen started working with her niece when she was one year old.

Sarah has long blond hair, held back with barrettes, coiling in old-fashioned ringlets. When I met her, she was wearing a purple sweatshirt and pants, with purple sneakers. Her face was round. Her eyes were blue. Her mouth was full of baby teeth.

Karen put Sarah's two most recent paintings out on the table. The canvas was not primed. Sarah paints directly on it, using acrylics. She has a table with paints squirted out on styrofoam plates, a tin can with water and brushes. She wears a little apron. Huge windows let light into the partitioned-off space.

Karen phoned me to tell me about how two of Sarah's recent paintings dealt with the problem of representing where sky and land meet. Karen was bowled over by Sarah's solution, as well as by the fact that Sarah had given advice on how to solve this problem to a seven year-old. On the strength of this phone call, I came to interview Sarah about her work.

First, Sarah discussed the painting "Playing with my cousins":

"This is me and my cousins. We are playing a game. The baby just watches. We are playing 'Ring Around the Rosie.' We are holding hands, about to fall down. You know we are about to fall down because one person is without holding hands. The smiling faces show we feel good about the game. The white pants are cowboy pants. The others are plain pants. There is a slide (painted with actual silver paint), people and grass and sky. The sky does touch the grass."

Ashley, the seven year-old, had been painting next to Sarah. Sarah noticed that Ashley had left a large white horizontal band through the middle of the painting. Sarah said, "There was white space. I said, 'You have to put the grass higher. There is no white between. I know because I looked outside.'"

I asked Sarah about the sky as a mass of overlapping horizontal streaks in both of her paintings. "That's the sun. The yellow, pink and blue clouds make the sun." I asked Sarah how most children make the sun. She said, "A circle with lines on the side." Sarah said, "I used my favorite colors for the sun." She added: "This is the way it looks."

Sarah's comments about how to paint the sky and the sun are based on her observations of what the sky and the sun look like. Sarah sees the sun all over the sky. She does not need to use hand-me-down images of the sun, houses and trees and flowers foisted on children by adults. Sarah can see for herself.

I asked Sarah how she felt about painting. She said, "I feel happy. I can draw stuff about my family and the beach. I like these two."

Before I left, Karen talked about the concept of Best Practices for teachers. She said, "You've got to prove your literacy program, bringing together the best practices for parents, like Drawing/Writing."

As the Russian psychologist Lev Vygotsky pointed out, the learning strategies that work for children with delays and deficits and dysfunctions work as well or better for children without them. Lev Vygotsky, The Mind in Society, 1978

The arts provide best practices for young children because the arts allow self-training in seeing and in paying attention. The attentive child sees the world as it looks to her and she learns to represent it as it looks to her and to defend that representation, using her own words. She seeks, she finds, she feels satisfaction. Sarah knows how the sky looks, how the beach looks, how her cousins look playing "Ring Around the Rosie." Her thinking is and will continue to be based on personal experience, filtered through her visual cortex, her emotional circuitry, her speech and her art. As I watched Sarah paint and as I listened to her talk about her work, I could feel her brain working smoothly across visual, emotional and verbal levels, practicing self-integration. Her paintings and her discussion show that Sarah is building a visual/verbal self on her own terms.



WESLEY:

The courage to invent solutions to difficult problems

In March of 1993, I gave the first scribbling workshop for parents/caregivers and children in Westchester County, New York State. Hosting me was the Garden Road Nursery School. Sixty or so people attended, from babes in arms - to first-time parents in their late forties, early fifties. We had children of nursery school age, elementary school, middle and high school ages.

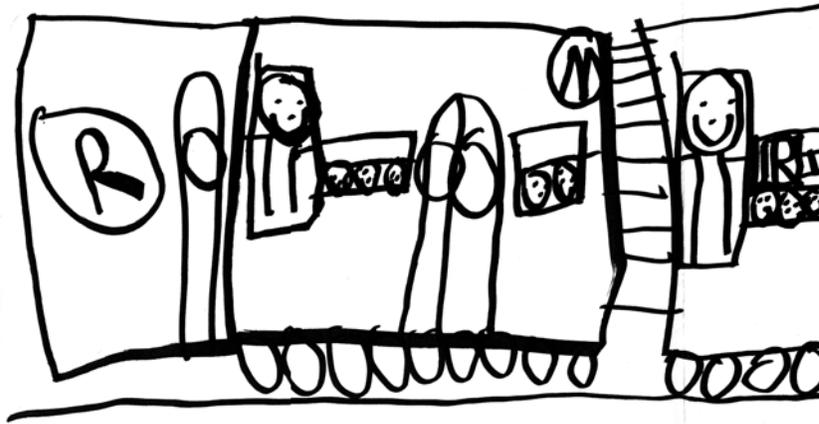
One hand, moving back and forth across a paper, produces attention - getting marks, teaching the child, first and foremost, to pay attention, a critical skill for learning, and for growing, sustaining and restoring cognitive function.

Communication is a back and forth dynamic that occurs between mother and child and between all the parts of the child's brain and between the child and her handmade marks. The child learns to "mother" herself.

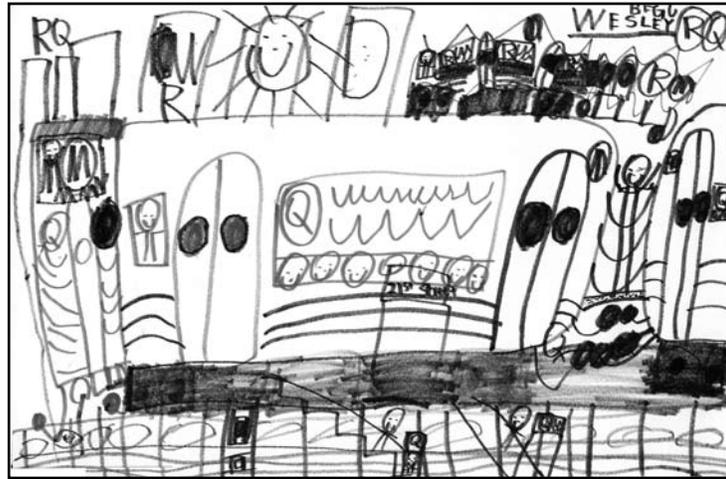
We all scribbled, drew, wrote and talked about these kinds of marks for two hours. Three year-old Wesley drew the "R" train, over and over again. He had a system and he followed that system for organizing the train, the engineer, and the passengers. In two hours, he produced eleven drawings of the train. He never stopped drawing. Remember, Wesley is only three. Two hours of drawing at three years of age!

Wesley's mother, Berty, asked me whether Wesley should be drawing other things. I thought, then answered, "Wesley is perfecting his R train. He does not need to draw other things." I wasn't sure I was right, but I figured Wesley must know what he was doing.

The next day, I spent the morning at the Garden Road Nursery School. Wesley continued to draw the "R" train. The head teacher, Donna, was sitting beside him. She asked Wesley more about the train station. Wesley talked about the stairs. Donna asked him if he could draw the stairs. Wesley became very upset. Donna looked at me and said that Wesley gets upset if he can not do something. This was, as far as I was concerned, a critical moment in Wesley's life. It was also a critical moment in my life as a researcher. Donna seemed to know what was right and Wesley was resisting this. Was Donna right, I wondered?



"R" Train #2 Wesley G. Feero © 2003 Bert Barrano Feero. Reprinted by permission of Bert Barrano Feero



"Drawing of stairs with roof over them" Wesley G. Feero © 2003 Bert Barrano Feero. Reprinted by permission of Bert Barrano Feero

Donna decided to draw the stairs. Wesley looked at the sideview and was completely buffaloed. He had no idea how to do what Donna had done. He was anxious, angry, very upset. I continued to feel very worried.

Donna showed Wesley how he could make an "L," and then hook "L's" together to make a sideview staircase. Wesley fussed and muttered and protested, but, then, with sufficient jolly from Donna, he drew his own connected "L's" staircase. I was deeply relieved. Donna was relieved, but she was less relieved than I was because she was "an old hand" at working with Wesley, whom we might identify as talented and gifted - though, also, prickly, impatient and temperamental.

Donna asked, "What else is in the train station?" Wesley said, "The roof." I thought, "Oh boy. He is going to need to build a three-dimensional model to show the roof over a subway." Donna asked, "How would you draw the roof?" I cringed, mentally. Wesley thought a minute and then, using a wide black marker, drew back and forth, confidently, over the staircase - in effect, layering the roof over the stairs. I was dumb-founded. Relieved, but dumb-founded.

Saving Literacy

Wesley was perfectly content with this solution. The fact that you could no longer see the stairs did not bother him. He knew what was there, under his blackened drawing.

Just think how big a mistake caregivers could make if they tried to describe this drawing without knowing how it was done. How many of Sainte Exupéry's "grown-ups" would be able to say, "I see that you have placed the roof over the stairs in the train station?" How many would say, "That is a mess. Why did you draw all over your perfectly nice staircase? Now, we can not see a thing."

Whether or not Wesley needed to break out of the security of his "R" train formula, he did break out of it with the help of a respectful yet experimental adult mentor named Donna. In addition, Wesley was able to solve, using two-dimensional marks, a very difficult spatial problem. He moved from petulant fearfulness to confidence using marks and a mentor.



MAEVE

The co-existence of abstraction and pictorial representational

Maeve is an articulate four year-old. In the figure drawings Donna showed me, Maeve had reached the pictorial stage of drawing when marks become recognizable to other viewers: in this case, human figures using both the stick figure and the tadpole approach. I asked Maeve whether she would like to do some scribbling. She agreed. Maeve had been in the workshop the day before, scribbling and drawing for two hours.

I set up my large easel with its newsprint pad in the kitchen, which doubles as an art room at the nursery school. For an hour, Maeve scribbled over many sheets of newsprint, a 2 foot by 3 foot pad. She'd make a mark, consider it, invent another, consider it and move on, generating vast, complex skeins and webs of marks. It was like watching a gestural ballet. The range of marks - you might call it the range of styles - Maeve produced is astonishing. Kandinsky, Klee, Mondrian, Miro, Gorki, Cy Twombly. If you isolated any single set of marks, you would not believe that any of the adjacent sets of marks belonged to the same child. Maeve teaches us that any child, or any adult for that matter, can move freely between one kind of drawing and another and that, within one kind of drawing, styles can vary dramatically. Only professional artists are held, by the buying public, to some consistent style that can be named, priced, bought, sold.

We need to remember that a child who can draw a "tadpole/human" may still scribble with energy and inventive abandon, working, in effect, as an abstract expressionist, while the child who scribbles may soon draw the "R" train, venturing into the mysteries of multiple layers and tricky perspectives or cubism including suprematist invention.



SAMUEL
Invention of metaphor

This story involves a three year-old who invented metaphor. One day, out of the blue, this little boy decided to call birch trees “zebra trees” and macaroni “rainbow noodles.” Whammo, metaphor happened, just like scribbling. At a certain point, children start to put words together in brand-new ways, just as they did with scribbles.

To introduce this story, let’s look at certain stages in the physical, emotional and mental development of young children, again, “bolding” some items that are especially relevant to a theory and practice of mark-making. Children may move through this progression differently.

- Squirming and wriggling inside the womb
- Belly laughter at about 2-3 months of age, probably on recognizing mother’s face in the middle of the night
- Reading/looking at pictures
- **Scribbling**
- **Reading/looking at scribbles**
- **Reading/Talking about scribbles**
- **Drawing**
- Reading/looking at drawings
- **Reading/talking about drawing**
- Reading/talking about pictures in books
- **Producing proto-mathematical, musical, and text-based marks**



*Sam sitting on grass at age 3, 1978.
Photo by author.*

- **Reading one's own proto-mathematical, musical, and text-based marks (invented spelling)**
- **Inventing verbal simile and metaphor**

Douglas Hofstadter, author of the brilliant breakthrough interdisciplinary book *Gödel, Escher, Bach: The Eternal Golden Braid* (1979) describes all thinking as analogical (2001). Hofstadter uses analogy in the broadest sense as the way we map outer experience onto inner perceptions, and vice versa.

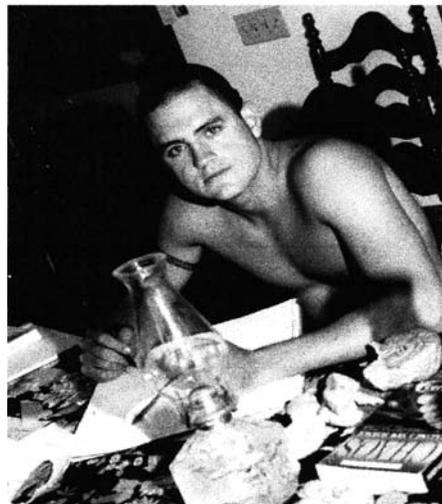
By mapping, Hofstadter means how one idea fits onto another idea. If one item maps onto another item, this does not mean there is an exact fit. For instance, a saucer does not fit onto a dinner plate the way a square of one inch fits exactly over another square of one inch. But a round flat object “maps” onto another round, flat object. In the following analogy a saucer will map onto a *rectangular* foundation.

An analogy is a specific kind of mapping and it takes this form: “As A is to B, so C is to D.” We can invent an analogy about saucers and, say: As the saucer is to the cup, so the foundation is to the building.” The analogy, or the comparison between the saucer and the foundation, rests in the nature of the support provided by saucer and foundation; both insulate what they support. Saucers protect surfaces from the heat of the cup, while foundations protect buildings from frost and water. One protects downwards, the other protects upwards. This is one way to examine this

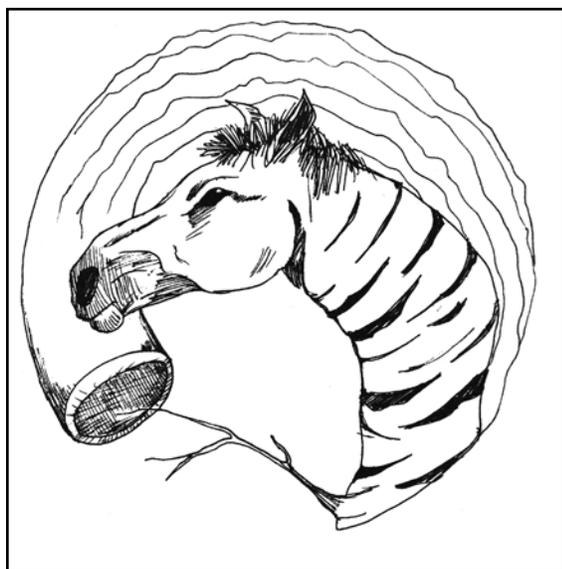
particular analogy. That is the point of analogy; it makes sense in a particular way. The analogy helps the analogy-maker and the analogy-receiver understand saucers and foundations in new ways. The human brain is able to illuminate itself grammatically by mapping one idea on top of another, achieving idiosyncratic cross-wiring. If the human brain did not need simile, metaphor, and analogy, it would not have invented them.

Zebras map onto birch trees as black and white patterns, rather than as similar shapes, while rainbows map onto noodles as curved shapes, not as colored patterns. In the first case, a shared pattern maps; in the second, a curved shape maps.

It looks as if toddlers map internal patterns and shapes onto external scribbles, first and



*Sam Sheridan at dining table, doing drawings for 1997 textbook **Drawing/Writing and the New Literacy**.*

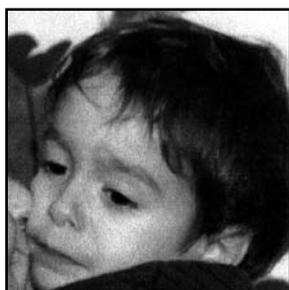


"Rainbow Noodles and Zebra Trees," drawing 1996 © Sam Sheridan. Reprinted by permission of Sam Sheridan

then three year-olds map the external world back onto internal models, creating “schemas” to represent the world.^{24A} Schema is the Latin word for “shape, figure, form, fashion.” A schema is a mental structure which represents some aspect of the world.

The small child looks inside her brain first for information and then it looks outside, before it looks back in again. Presumably, this outward/inward mapping becomes possible because the three year-old has stored up enough perceptions (shapes, patterns, words, images) to work with. As presumably, the three year-old’s brain is still pre-inhibitory; it will do what it must do. If the three year-old talks metaphorically, then metaphor must be a survival instinct, like scribbling and laughter. Metaphor was not invented by English teachers. It was invented by very young brains designed to think using words and images and analogical thinking. The big human brain is an energy-hog; speech and literacy are “expensive” in terms of energy. By using speech, art, literacy, mathematics to “figure things out,” we work hard, but then take a mental rest. The joy of understanding is neurobiology’s solution to the neural expense of language-based symbolic thought. Symbols are the problem and the solution for the human brain. We will explore the relationship between simile and metaphor and analogy and algebra in young children’s thinking and mark-making on pages 203-204.

Sam Sheridan is now a published author, *A Fighter’s Heart*, Grove/Atlantic, 2007 and *The Fighter’s Mind*, Grove/Atlantic, 2010.



Evan, 2003. Photo by author

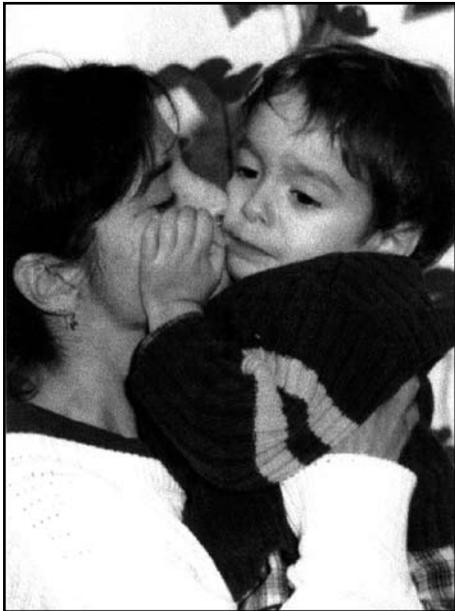
TERESE AND EVAN
Autism - some questions and some answers.

The following e-mails are from a mother of an autistic son who lives in Westchester County, New York. Terese and I were neighbors in Framingham, Massachusetts nearly 40 years ago. Terese is a singer, a story teller, and a founder of a nursery school. She has been waiting for this book for eight years.

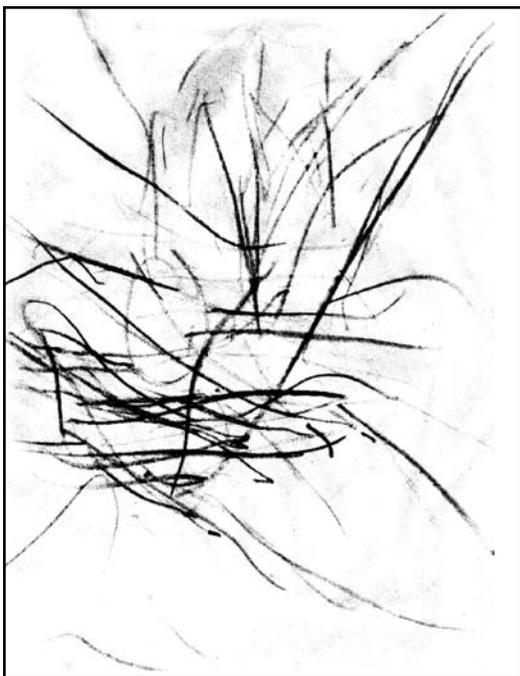


Evan and Terese, 2003. Photo by author. Reprinted by permission of his mother Terese Giammarco.

^{24A}Piaget, Jean. 1926. *The Language and Thought of the Child*. Harcourt Brace:NY.



Terese and Evan, 2003. Photo by author



Scribbles by Evan as he begins to emerge from autism. Reprinted by permission of his mother, Terese Giammarco

Date: Wed, 22 Aug 2001 21:17:20 -0400

Hi Susan,

My son Evan has learning delays. Mostly with speech processing. I have been searching high and low for answers as to why so many children have these problems. The numbers seem to have grown exponentially over the last ten years (1 out of 150!). The answers to my questions are very uncomfortable but they also are helping me to find ways to help him. For example, there is some question about my receiving a Rubella shot when Evan was only 4 days old and breast feeding... there are so many factors. Now I want to help other mothers to be more informed. But mostly I want to help Evan. He has been doing very well with early intervention, dietary intervention, and mercury detox (homeopathic). I am very interested in working more with children who have these delays. What kind of response have you had with your work in this area? This is probably a lengthy question. You don't have to answer everything. I am sure we can talk when you come. I can't wait for you to meet Evan. Your book is first on the reading list right now. My mom brought her copy to Mass. this week to show her niece who works with special and gifted children. Will keep in touch with more details.

love
Terese

Date: Thursday, February 14, 2002, 6:15 PM

It's 2 p.m. and I am here in the office of our new house making an attempt to write about a topic that is utterly overwhelming to me: children with developmental delays. My son Evan is three and 1/2 years old. He is here with me while I type, playing with his doll house trying to make the little toy man climb the stairs. Banging him, throwing him and all the while singing from one of his favorite musicals, loud but notably in key. We have to leave shortly for his appointment with his developmental pediatrician. This will be his second evaluation of this kind. Last February we also saw his doctor who, although he does not encourage it in children as young as Evan, gave us a diagnosis of P.D.D., Pervasive Developmental Disorder, a very general

description. The reason for the diagnosis is to do with a certain pressure that comes from the public school system; for Evan to receive optimum services provided for by the county school, he needs to have a medical diagnosis.

We first began to notice that Evan was having some difficulty in the fall of 2000. I would collect him and bring him out to the nature parks and we would meet some friends with children Evan's age. They would greet us with hellos and hugs and kisses while Evan stayed on his own running in endless circles on a wooden platform avoiding any contact and taking no notice of the other children except on occasion when they blocked his path. We would try to engage him in games like catching a ball or ring around the rosie all to no avail. These days became exhausting for me and I would leave my friends just in time to get to the car and burst into tears. I was angry, confused, embarrassed. What was wrong with him? What was wrong with me? I am trying so hard and I cannot reach him.

For parents with "autistic" or P.D.D. children or any other title that falls under this "spectrum of autism," this is not an unusual scenario. What may follow is a period of denial or a period of blaming yourself or your husband or the combination of the two and then finally a cry for help and the admission that your child needs help.

We got the help from the Early Intervention program recently funded by the federal government. They were very kind and helpful but they could not answer the one question that plagued me night and day - why??? What happened?... So I set off on a journey of research that continues to this day.

There is not just one answer to the question "Why?", there are many answers, many factors and good reasons why today one out of 150 children is diagnosed with some kind of developmental disorder. These numbers to me are of epidemic proportion, considering the statistics that show 1--12 years ago 1 out of 10,000 children suffered from these symptoms. What is going on here? It is just that we are able to spot it better? Possibly, but there is so much more to consider...

Before Evan's first birthday, we noticed that he was developing normally, playing with blocks, saying words like ball and apple, finding an indelible marker somewhere and drawing on the walls (this to my chagrin was not encouraged). It was only later that these new abilities began to fade. It was so subtle. The words turned into babble, the playing became



Evan and Terese, © 2008, seven years later, reprinted by permission of his mother Terese Giammarco.



Evan and Terese, ©2008, seven years later, reprinted by permission of his mother Terese Giammarco.



Evan finger painting, photo © 2002, Terese Giammarco, reprinted by permission of Terese.

obsessive and the drawing stopped all together. It's almost as if the mark making faded with the language!...

Date: Mon., Nov 4, 2002, 10:53 AM

Dear Susan,

Thank you so much for sending me this book ("The Thinking Child" with the scribble/drawing steps). I read it from cover to cover, then got to work. It really helped me realize something very important in my work with Evan and in the work that we do with children... and that is not to expect so much from them. I have been trying to motivate Evan to scribble

and draw for a very long time with very little success. After reading this book I realized that, at least in Evan's case, it is really a process and not a result oriented thing here... I have watched Evan progress over the last 2 years and it is painfully slow. I am beginning to understand and value the true meaning of patience... it is highly underrated and not so easy to hold. I will write a little play to give you an example of what happened and when the light bulb went off.

DAY 1. the scene: our play room, at the table with big paper and crayons...

Me: O.k. Evan, come here, let's color with crayons, look I am going up and down and now across and now zig zag zig zag (Evan laughs at the sound of this word and it catches his attention, he's interested!) and now dot dot dot dot.. (more laughter and interest). O.k. you try here's a crayon...

(Evan makes dots on the paper, his attention is held for a few minutes and then he is interested in my drawing only...)

DAY 2. the scene: our play room, at the table with big paper, paints and brushes....

Me: O.k. Ev's here we go, paint and brushes, look I am going up and down and zig zag zig zag (he remembers this funny sound from before and is interested again, comes to the table and begins to stick his fingers in the paint, he also uses this medium at school, they are very encouraging to him and he actually has a fair amount of paintings that he has done himself...) I guide him to use the brush and he scribbles for a good few minutes with me narrating the scene and working on my own painting as well.

DAY 3. the scene: our play room with big paper pens and pencils... Evan is sitting at the table with me at the beginning

Me: Look, Evan, Mommy is drawing with the pencil. I am going up and down and scribble scribble scribble, dot dot dot, zig zag zig zag... (I offer Evan the pencil and he scribbles with some interest for a few minutes.) When he finishes and gets up to leave I point to the paper where he has scribbled and ask him "Evan what is this?" and he says "That's a paper" (pause) "That's a picture." EUREKA!

Date: Dec. 2002

Dear Susan,

I am so excited. Evan did his first finger painting! I have photos and will write about it...

Love

Terese

Author's Response to Terese Giammarco's letters with a story about a boy from India

Since Terese and I started corresponding, we have been sharing theory and practice around children and marks of meaning. "60 Minutes," CBS News, Vicky Mabray, Jan. 15, 2003, documented the story about a mother from India named Soma and her sixteen year-old son, Tito. This mother and her son have turned the theory and practice of autism on its head. Instead of thinking about autistic children as unreachable, one of the keys to reaching them is one-on-one, full-time badgering, using language, including forcing children to use a pencil to make marks.

Soma noticed that at age three, Tito was not doing what a normal three year-old should be doing. She was told he was mentally retarded and all she could do was "keep him busy." Soma left her field of chemistry and devoted the next eleven years to her son. She noticed that as a young child, Tito stared at calendars. So Soma started using numbers and letters to get his attention. When he wouldn't hold a pencil, she used a rubber band to tie one to his finger and taught him to draw lines and eventually to write. Now, at age sixteen, Tito still rocks and flaps his hands to self-stimulate attentionally to keep himself in this world, but now he can tell us why autistic children do this "stemming." Although he still can not speak, Tito can write. He answers questions about how he thinks and feels using words, speaking for other autistic children.

Soma has been a "tireless taskmaster," talking and teaching Tito every waking minute. She calls her strategy "Rapid Prompting Method," which "seems to keep children's attention focused long enough for them to communicate. She ignores their erratic movements and wandering eyes and focuses instead on the mind locked inside" (Vicki Mabrey, CBS News). Soma is now working with a small school named Carousel in Los Angeles where she is prompting severely autistic children to respond by pointing to letters which spell out what they are feeling and thinking. These children learn to read and write and do mathematics by simply watching the world around them. At last, with intense, unremitting verbal prompting, and with words (or letters) on cards, children are able to gesture to the word or the letters they need, revealing their pent-up thoughts. The breakthrough is amazing. For the Scribbling/Drawing/Writing program in this book, the implications are appreciable.

Marks of meaning unlock meaning for some children who would remain locked away from us and from their own minds for the rest of their lives. My theory is that Tito connected with the calendar because the high contrast marks on the page provided a visual field that he could make sense of, from which he could extract meaning. Neuroscience is now providing the information about the visual cortex which would support the fact that autistic children are able to separate figure from ground when there is strong contrast between figure and ground.^{25,26,27} Presumably, the face of the mother just does not have enough high contrast edges to grab the autistic child's attention. Marks on paper do. This is a working theory for why caregivers should badger autistic children lovingly and unremittingly around mark-making, as Soma has, so that their children will be able to express themselves using marks if not spoken words. Remember the famous case

²⁵Zeki, Semir, 1999. *Inner Vision: An Exploration of Art and the Brain*. London: Oxford University Press.

²⁶Zeki, Semir, 1999. "Art and the Brain," *Journal of Consciousness Studies*, Vol. 6, No. 6-7, June/July.

²⁷Ramachandran, V.S., Hirstein, William. 1999. "The Science of Art: neurological theory of aesthetic experience," *Journal of Consciousness Studies*, Vol. 6, No.6-7, June/July, pps. 15-51.



Nadia: a case of extraordinary drawing ability in a child in Lorna Selfe's Nadia, 1979, with permission of Harcourt, Inc., Elsevier Global Rights Dept., Oxford, U.K.

of Nadia, the autistic artistic child-genius? (See Winner, 1982;²⁸ Kellogg, 1970,²⁹ Selfe, 1979³⁰).

We can reinterpret the word “artistic” to say that Nadia was able to use marks as high contrast, contour drawings which captured essential lines and shapes - of horses, for instance - to self-stimulate her visual attentional system. Once Nadia did learn to talk, she lost this gift. Presumably, her genius with drawing drove the eventual acquisition of speech. She could then leave her brilliant drawing skills behind because she no longer needed to compensate for lack of speech or to organize her brain for speech through the physical/emotional act of drawing.

Soma's breakthrough with Tito, and Terese's work with Evan, show that determined, devoted mothers can achieve success with autistic children using mark-making (as writing) as a major strategy for communication.

The work of Stanley Greenspan³¹ (which does not include scribbling and drawing with autistic children), describes his famous “floor time,” supporting Soma's intense one-on-one mothering. Soma has shown how marks of meaning make communication possible. Terese has shown how scribbling and painting help the autistic child to hook up the brain, right to left, left to right, visual cortex to limbic system, limbic system to pre-frontal and frontal lobes, creating a functional communication system.

As Vygotsky made so clear, the child with problems is the child who points the way to showing how all children can be encouraged to grow and learn. Marks of meaning are useful to many different kinds of children. Caregivers need not wait for speech and literacy to happen. Caregivers can be coaches and cheerleaders, models and mentors around marks of meaning, just as they can use signing to communicate with toddlers.

²⁸Winner, Ellen, *Invented Worlds*, 1982. Harvard University Press: Cambridge, MA.

²⁹Kellogg, Rhoda, *Analyzing Children's Art*, figures on pages 14, 49, 56, 101, and 109 © 1969, 1970 by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

³⁰Selfe, Lorna, 1979. *Nadia: a case of extraordinary drawing ability* in an autistic child. San Diego Elsevier, Global Rights Department. Oxford, U.K. Harvest/Hbi Book. Harcourt Trade publications, Orlando, Florida.

³¹Greenspan, Stanley M.D., 1999. *Building Healthy Minds: The Six Experiences that Create Intelligence and Emotional Growth in Babies and Young Children*. With Nancy Breslau Lewis. Perseus Books, Cambridge, MA.



WILLIAM THE GREAT
Attention, vision, and personality.

Mothers will tell you that children are born with temperaments. Calm, pleasant babies usually remain calm and pleasant as children and adults; fussy, angry babies usually continue as cross, fussy adolescents and adults. A woman I walk with every morning in Maine told me this story about her first-born, William.

"William was in the breech position for the last month before birth. Despite a somewhat difficult passage, his Apgar score was within normal limits, and, within a few hours of birth, when he was brought to his mother in the dimly lit recovery room, he was able to fix his gaze on his mother and hold that gaze. Then, he turned his head toward the lights. After that he regarded his parents for a long time. His mother wrote, "He was awake and clearly studying us. He was quite the bundle - a darling, intent face framed by two hands and two feet!" His mother was in her sixties when she told me this story. The attentive, searching quality of her newborn's gaze struck her at the time of his birth and stayed with her for the next forty years. By the time he was fourteen months old, Will was able to amuse himself for long periods of time. He did not find the playpen nor the highchair confining. One evening during that time period, his mother had guests for dinner. Will was left in his playpen with a catalog. Two hours later, his mother found him still turning the pages, looking at them, with no page torn. She said, 'He was content.'

"First, you need to show interest in and support for the child's scribbles... take serious note of them, honoring them as significant marks."

"His sister, on the other hand, was a colic-y baby; she was born with one eye open and one eye closed. She hated her highchair and her playpen. She'd climb anything in sight. When it came to language, both children continued to show differences; Will spoke every word carefully, understandably. His sister rushed through words and sentences, babbling unintelligibly, using inflections, to indicate a question or a command. 'She had no patience with the work of forming words.' "

However, both children spoke in sentences by the time they were two, this former English teacher told me.

My friend and I hypothesized that the ability to sustain visual attention might be a predictor of temperament. The infant whose brain was calibrated, even before birth, for sustained visual attention might be able, at 14 months, to sit happily for two hours in a playpen looking at the pictures in a catalog. William spends hours reading now as an adult. My friend added that William has a high tolerance for pain. His sister, on the other hand, has a low tolerance for pain.

We wondered together at the connections between certain fetal brain states and the emotional tone of childhood called temperament, on which personality rests. If our basic emotions include

FEAR, PANIC, RAGE, and a SEEKING drive (Panksepp, 1998), and if these basic survival emotions are tied to basic temperament, then it looks as if fetal brains are tuned for one emotional temperament or another. And so we are born timid, or aggressive, for instance. In addition, it looks as if some children are born with a special ability for sustained visual attention (or "the artist's eye, the eye for detail" as my friend calls it). If a happy, curious temperament and a good eye are combined in a fetal brain, then we get a boy like William, a child with a sunny personality thanks to the positive neurotransmitters that accompany searches for meaning in the child who can amuse/inform himself for long periods of time. (Neurotransmitters are molecules which are responsible for the sending and receiving of information in the brain. They also create emotional brain states like depression or, on the other hand, "runners' high.")

Will's story makes us wonder about the ability in a newborn to sustain attention as a predictor of emotional tone and even of intelligence, as if calmness and smartness are brain advantages that are tied to an ability to sustain focus (this speculation was written six years before research on autism in connection with attention surfaced). If the brain rewards "calmness" as energy-conserving behavior and if intelligent behavior encourages attentional calmness, then, clearly, these two traits will be rewarded by brain chemicals.

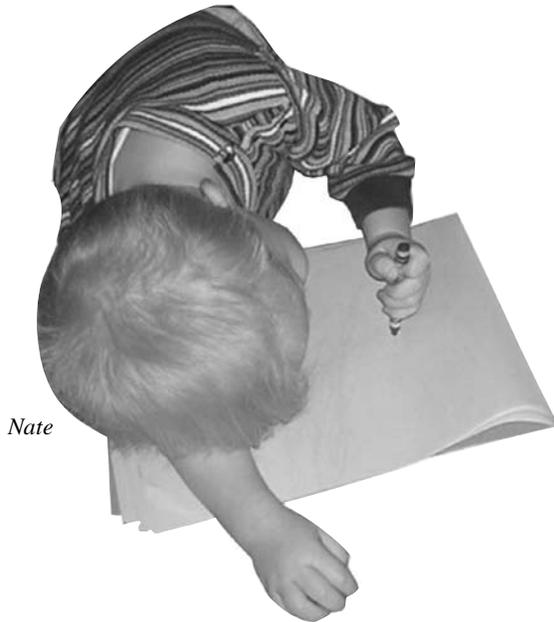
Sustained attention, vision, mood, intellect

We know that newborns see lights and darks, or rough edges. They do not see mother's face as a face and could not recognize it at this point, even if their vision were acute enough (which it isn't). But if the ability to attend to the environment, its sounds and sights, smells and feels and tastes, leads to or is driven by the emotion of SEEKING which releases feel-good neurotransmitters,⁹ then it makes great sense to help children learn to pay attention visually. Maybe - more than helping babies' eyes focus - parents intuitively hang mobiles over baby's cribs, to stimulate babies' visual attention. Maybe that's why parents play Peek-a-Boo, helping the child to sustain visual interest in the game for longer and longer times as parents stretch out the time it takes them to bring their hands away from their faces. Maybe that is why parents read story books to children and encourage them to scribble and draw. Caregivers know children need to learn how to pay sustained visual attention. If the quality of a child's attention, including visual attention, affects the emotional tone of childhood, then caregivers need to know this. Vision, attention, personality and intelligence are related. This does not mean a timid child will roar like a lion when she scribbles. It may mean that a shy smile of budding confidence will light up her face, as her pencil skitters across the page.

⁹Panksepp, Jaak, 1998. *Affective Neuroscience*. New York: Oxford University Press.

Scribbles, Development and Meaning

Scribbles



Nate

On this adventure into scribbling, the little child will be your guide. When it comes to the earliest stages of literacy, the child is your teacher and your mentor. Still, each child benefits hugely by interested support. Look at the marks! Listen to the words! Hear what the child is saying!

To support scribbles as important physical and mental activity, we need to create the time and the space for marks. Then, taking this book to heart, we'll join children in the adventure of literacy, scribbling and drawing and writing with them.

Scribbling is a language we can not read, because we've never been taught how. This book will help us to read scribbles as a developmental unfolding of marks. We are not meant to read a child's scribbling the way the child will. Still, we can all learn to talk intelligently about scribbles as lines and shapes. Only the child can talk about scribbles as animals, people, ideas, stories. The marks belong to all of us. The meaning belongs to the child.

The scribbles made by each child are that child's special marks, meant to be read first, and only, by the child who made them. I can not emphasize this point enough. If we let children read their own scribbles and drawings and invented spelling, first (and by reading these marks, I mean talking about them), if we let children do this before we ever ask them to read someone else's words on a page, we would have far less problems with children's reading and writing. By parsing mark-making activities, chopping them up and severing words from pictures and pictures from words and numbers and musical notes from pictures and words, we cut children off from the natural connections between their own marks of meaning. Such disconnections and discontinuities encourage learning disabilities.

As a caregiver, you can keep the flow of marks connected by encouraging scribbles and drawings and words and numbers and musical notes. You can handle scribbles! You scribbled once. You drew. You wrote your first words. You also qualify as The Expert Scribble Encourager because you recognize the importance of the event.

***“Scribbling is . . .
a language we can not read,
because we’ve never been
taught how.”***

Saving Literacy

Does this mean a caregiver will stop reading to children? Of course not! You will still teach children to read by reading aloud.

Allowing the child to take the lead in scribbling is going to be a hurdle for some caregivers. But, look at it this way. By letting a child take over some of the business of what it means to be human, you can take a rest from the responsibility of caregiving!

Besides the idea that a child can take the lead in scribbling, here's another proposition: by scribbling and drawing and talking about **your** own scribbles and drawings with a child, you are going to become the mark-maker you were meant to be! Maybe you're a writer, an artist, a math-lover, a musician!

Early experience and later development

How the brain learns to think determines how that brain will think. We know that not all of the neural networks established in childhood become hard-wired. The brain is "plastic." It can change. Still, we are becoming increasingly aware that young, impressionable brains learn fast and well and that early learning "sticks".

When I began to study neurobiology in the 1980's, we thought that brains did not grow new neurons. A brain "came with" about 10 to the 11th power neurons and then, at mid-life, started to lose thousands of neurons a day. Later, research corrected that position: the brain did grow new interneurons, or insulatory glial cells.³² Now, we believe that the brain grows new neurons. Recent findings even suggest that adult stem cells can "morph into many types of cells."³²

The brain grows itself, builds itself and repairs itself in childhood and in adulthood. The brain makes and breaks billions of connections, remembering, forgetting, learning, unlearning. The brain uses its right and left hemispheres in cooperative, if not co-equal exchanges. The goal of caregiving, education and a well-lived life is using our brains to the fullest.

Using our brains to the fullest means using images and words, numbers and graphs, sharps and flats to think. Do we want to think this way because it is a worthy endeavor? Of course! But we also want to think in all these ways because symbolic thinking is fun. Dopamine and opioids and other brain chemicals make thinking its own reward.

By now, everyone knows that there are "windows of opportunity", or critical periods for certain kinds of neural connections to grow in the brain, including the circuits for vision and for language. These windows of opportunity are not as narrow as we thought. A child can learn to speak later in childhood, even up to the age of eleven. But the later speech is acquired, the



Ben

³²Holden, C.; Vogel, G. 2002. "Plasticity: Time for a Reappraisal?" *Science* 21 June 2002, Vol. 296. No. 5576, pp. 2126-2129.

harder it is to acquire and speech acquired late will not be as fluent as language learned in early childhood. After about the age of eleven months, babies stop being able to distinguish certain sounds if they do not hear them in the speech around them. Think of how hard it is for a Chinese-speaker to say the letter “r.” Think about how hard it is for an English-speaker to pronounce the “eu” in French or the umlaut or the “ch” in German.

***Look at the marks,
listen to the words,
hear what the child
is saying***

We are also learning that something as pervasive as the emotional tone of childhood has lifelong influence.

One thing is sure: Adult personality shows the effects of childhood abuse and neglect. People can survive abuse, but their brains suffer damage. One commonly damaged area is the amygdala, a brain area connected with rage-control and memory. Studies of the brains of incarcerated males (autopsied after death) show amygdalar damage. Many criminals suffer abusive childhoods. Cortisol, the stress hormone, literally acts as a mordant, eating brain tissue. Criminals who say they cannot remember their crimes are often telling the truth. Their memory centers, along with their ability to control rage, were compromised in childhood. Criminal abuse of children produces criminal adults, who cannot control negative emotions, much less remember their crimes.

Adult personality takes many of its cues and traits from childhood experience, both positive and negative. How the adult brain learns in childhood to feel about literacy will influence the emotional tone as well as the expressive and communicative skills of that adult, determining, in a very real sense, that adult’s “quality of life.”

Toward a new, brain-based science of early childhood: The bi-hemispheric brain and Neuroconstructivism

“What we most need now.. is a fresh perspective on the masses of data that neurobiologists have gathered, and on the puzzles those data pose. ...How do brains makes sense of the world... a new general theory... requires new assumptions and new definitions. I believe that the idea of meaning, a critical concept that defines the relation of each brain to the world, is central to current debates in philosophy and cognitive science, and will become so in neurobiology.”

Walter J. Freeman, 2000, *How Brains Make Up Their Minds*, p. 17.
Columbia University Press

Bi means “two” and hemi means “half.” The brain is an organ with two halves. These halves are interconnected and communicate with each other. The brain is designed to work as a whole. Its parts remain in many instances equi-potential; they can assume some other brain function if need be. And many brain areas contribute to any one thought or action. Skills are not strictly localized. There is always hope for remediation and healing.

Still, in many brains, we know that if the right brain is cut off from the left brain and sees a ball, it can grab it, but it can not read the word “ball” nor connect that word with the ball. Similarly, if the left brain is cut off, or entirely severed from the right, it can read the word “ball,” but it would not be able to reach for a ball as a recognized or “read” object. That is, visual and verbal skills are localized in a very general sense, according to the right or the left side

Saving Literacy

of the brain. Bihemispheric brain development, or, more accurately, whole brain development, requires reciprocal, or back and forth input between spatial thinking and verbal thinking. This cooperative effect is responsible for what we recognize as effective, functional human speech and literacy. The program Scribbling/Drawing/Writing puts whole-brain science into practice by bringing spatial and linguistic brain skills into cooperative play in early childhood. Scribbling/Drawing/Writing is Neuroconstructivist. The term Neuroconstructivism first appeared in the 1991 Sheridan dissertation. The word neuro means “brain,” and the word constructivism means “to build together.”

The brain constructs itself according to genetic blueprints and experience. Infancy and early childhood are extremely sensitive and influential times for brain growth. Anyone who has suffered a childhood trauma knows the far-reaching effect of that trauma. The same is true for any infant or young child’s experience with nurturing. Childhood is hugely formative for a human’s lifetime capacity for and confidence in loving and learning.

The young brain is extremely susceptible to damage and to learning. No matter how young or how old the brain is, it benefits from strongly attentional, bodily, bilateral, integrative activities, like Scribbling/Drawing/Writing.

Neurobeneficial intervention

Beneficial literally means “making good,” and so the term neurobeneficial intervention means parenting and/or early childhood education which is committed to actively helping the child make or grow his own “good brain.” For a human, a good brain is able to speak language and write language, with the understanding that the word “language” includes not only the written form of spoken languages, but the symbolic, marks-based languages of art, mathematics and music.

Neurobeneficial caregiving

Neurobeneficial parenting might sound like a forbidding, technical term, but it simply means participating in responsive exchanges with young children in love and conversation and play for the sake of nurturing a good human brain. Neurobeneficial parenting and caregiving include some new elements, like emotional coaching, and scribbling and drawing, but caregivers can easily learn to do these things, one baby step at a time.



Nate and Ben Allen, 2006

Neuroconstructive experience

In the human child, Neuroconstructive experience includes certain goals, or cognitive skills: the ability to pay sustained visual attention, to self-regulate emotionally and to think using meaningful marks. The Scribbling/Drawing/Writing Program is strongly Neuroconstructive.

This book proposes early mark-making with children as the starting place for encouraging the child’s brain to construct these three important thinking skills and describes caregiver/child interactions around marks as the ideal way to launch and encourage the use of symbols.

Without the early, pleasurable, and increasingly meaningful creation of symbols in the form of scribbles, the human brain can only react to its ancient repertoire of mammalian survival emotions ---FEAR, ANGER, PANIC, SEEKING⁹ ---like an animal ---that is, as a mammal and a primate. Behavior conducted at an animal's level of survival is intelligent, but it does not occur at the level of consciousness and therefore of control and discrimination available to humans whose brains can override instinctual emotions through symbolic reasoning, that is, speaking and writing and reading.



Susan and John, 1947

Think of a time when you've been most troubled; did you talk about with someone? Did you write about it in a journal? Did the talking and writing help you make good decisions in bad situations? Or did you let anger or panic carry you away?

We are learning that emotion drives reason, not the other way around. We can learn to talk about the logic of emotions and to cultivate this emotional logic. On a television show ("Good Morning America," Feb. 10, 2003), pediatrician T. Berry Brazelton talked about calming fretful babies. Pretending to hold a crying baby in his arms, he rocked it back and forth. I paraphrase his advice as follows: "Sing to your child louder than your child is crying. As your child's cries get softer, sing more softly. By showing your child how to calm down, she will learn how to calm down all by herself. Emotional self-control is the key to a successful adulthood. She will have it made."

Does a successful adulthood really rest on the control of emotion rather than the use of reason? That's what the neuroscience on emotional intelligence is telling us. That's what the eminent pediatrician is saying, too. How we feel determines what course of action we choose from a range of possibilities. Emotion may convince us to choose an unreasonable course of action, even a destructive course of action. Has this ever happened in your life? Have you ever said to yourself, "If I had just calmed down... none of this would have happened."

We have no perspective on our emotions, no control over them without the distancing ability language provides. Without perspective or, literally, "seeing through" the situation (per means "through" and *specto* means "to look" or "see"), it is very hard for us, if not impossible, to resist the emotion driving the moment, even if giving in to that emotion is destructive. So, Neuroconstructive experience influences levels of attention, and degrees of emotional self-control, through increasing ease with language and literacy.

This book is about learning emotional self-control through marks of meaning. It is about a good deal more, but this is a big part of the message.

⁹Panksepp, Jaak, 1998. *Affective Neuroscience*. New York: Oxford University Press.

Neuroconstructive childcare

A Neuroconstructive childhood may also sound intimidating, but it simply means a childhood where there is time and support for scribbling and drawing and talking and emotional interaction. The time that parents and other caregivers spend with children is important and what they do with that time matters. Parents know this. They call it “quality time.” Marks of meaning --- a natural activity in little children --- is an important part of quality time. In fact, scribbling and drawing are almost as important as hugs and kisses and talking and reading with children. Mark-making and marks-based talk are not more important. They are as important. Love and literacy are co-equal in importance and how each occurs in childhood strongly influences the emotional tone in adult life, as well as a host of “logical,” “rational” thinking skills. Caregivers of young children benefit by knowing about Neuroconstructive childcare.

Nurturing on all Sides of the Brain: Neuroconstructive Childcare, a new social science

Words and images are neurally connected. The “slashed” term Scribbling/Drawing/Writing used to describe this literacy program, means that pictures and words are related and alike, near stand-ins for each other --- in fact, requiring and needing each other. As the term wave/particle describes the complex phenomenon we call light (which acts like a wave in certain situations and like a particle in others), the term Scribbling/Drawing/Writing describes the complex behavior we call literacy. The degree to which images and words are allowed to connect in the life of the child depends upon parenting and other educational experiences. Literacy is not ruled by the laws of physics the way light is, though there are quantum aspects to moments of intense self-clarification through literacy. (See “The Scribble Hypothesis,” www.drawingwriting.com and also page 244 in this book, Research Question FIVE, “Toward a Quantum Theory of Scribbling”.) Literacy is an evolved mental phenomenon with its own rules. Still, drawing can turn into writing and writing can turn into drawing, as light becomes a particle here, a wave there.

The brain is jury-rigged; like a renovated house, parts are kept, parts are added, parts are removed. Evolution does not take a wrecking ball to brains every time new environmental pressures ask for a modification. We think with the old bits and the new bits. We think with both sides and all sides of our brains.

As soon as ancient children scribbled in the dust and pictographs and cave paintings appeared on cave walls at a time when speech, too, was part of hominid expression, our modern verbal, literate brain was born. Like literacy, electronic technology will alter the brain again, changing its settings and parameters for attention, connection and literacy and new brain states will give rise to different modes of expression and communication and being. We must be hopeful about these changes. Because our brains are within our control, we can play a part in these changes.

This guide introduces a new social science: Neuroconstructive childcare. By demystifying the science of child-care and early education, we give caregivers confidence in what they do every day, while sensitizing them to the importance of one special milestone in children’s lives: scribbling. As we join in the child’s mark-making activity, we’re fulfilling one of our most important roles, too, as a human being: mark-maker of meaning.

The developmental stages of scribbling and drawing

“It has been shownthat the expressive gestures of the infant, from the moment they can be recorded by a crayon or pencil, evolve from certain basic scribbles toward consistent symbols... According to this hypothesis every child, in his discovery of a mode of symbolization, follows the same graphic evolution. Out of the amorphous scribbles of the infant emerge, first certain basic forms, the circle, the upright cross, the diagonal cross, the rectangle, etc., and then two or more of these basic forms are combined into that comprehensive symbol known as the mandala, a circle divided into quarters by a cross... the process... is universal and is found, not only in the scribbles of children but everywhere the making of signs has had a symbolizing purpose --- which is from the Neolithic Age onwards.” Herbert Read, 1963 "Presidential Address to the Fourth General Assembly of the International Society for Education Through Art." Montreal: August 19.

In the following pages we will describe the universal stages of scribbling and drawing and their relationship to children’s growth - visually, emotionally, and verbally.

Many authors have written extensively about children’s mark-making, including Herbert Read (*Education Through Art*, 1945), Viktor Lowenfeld (*Creative and Mental Growth*, 1947, 1978), Norman H. Freeman (*Strategies of Representation in Young Children. Analysis of Spatial Skills and Drawing Processes*. New York: Academic Press, 1980), Howard Gardner (*Artful Scribbles: The Significance of Children’s Drawings*. New York: Basic Books, Inc., 1980), Jaqueline Goodnow (*Children Drawing*. Cambridge, Massachusetts: Harvard University Press, 1977) and Ellen Winner (*Invented Worlds*. Cambridge, MA: Harvard University Press, 1982). *Saving Literacy* focuses on the work of two women who have reproduced and analyzed comprehensive records of children’s scribbles and drawings: Rhoda Kellogg²⁹ and Sylvia Fein.^{33,34} Read, Lowenfeld, Kellogg and Fein all provide similar models: The first stage of self expression through mark-making, or scribbling, extends from about 1-4 years of age. This scribbling may seem purposeless and shapeless, but it is purposeful to the child who watches her marks become shape-filled. I feel that the child who can sit up and make marks on the highchair tray with food is beginning the adventure of literacy and so we push literacy below one year of age.

Read, Lowenfeld, Kellogg, and Fein agree that the first attempts to draw visual ideas occurs between 4-7 years. The child knows how things look in his or her head and - given the chance - translates these ideas into shapes on paper. This stage of mark-making may be called representational, or descriptive or symbolic, depending upon how language is used.

We concern ourselves with the mark-making called scribbling and drawing in children from 10 months to six years of age.

I use the terms Early, Middle, and High, or Mature Scribbling, and Early, Middle and High, or Mature Drawing to describe the unfolding of young children's literate mark-making during this period. I will explain exactly what I mean by these terms.

²⁹Kellogg, Rhoda, *Analyzing Children’s Art*, figures on pages 14, 49, 56, 101, and 109 © 1969, 1970 by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

³³Fein, Sylvia, *First Drawings: the Genesis of Visual Thinking*. © 1993 by Sylvia Fein. Figures reprinted by permission of Sylvia Fein, January 22, 2003.

³⁴Fein, Sylvia, *Heidi’s Horse*. © 1976 by Sylvia Fein. Figures reprinted by permission of Sylvia Fein, January 22, 2003.

Rhoda Kellogg's twenty basic scribbles

Rhoda Kellogg describes twenty basic scribbles as the building blocks of art.²⁹ She also connects children's scribbles and drawings with universal design motifs, as does Sylvia Fein.³³ Kellogg observed, "Prominent in the art of prehistoric man are the abstract and early pictorial motifs commonly found in child art today. Indigenous art also contains these motifs. Yet most scholars have ignored this fact" (1970, page 208).

Neither Kellogg²⁹ nor Fein^{33,34} considered mapping scribbles onto mathematicians' representations of brain activity, drawing conclusions about these shapes as neural organizers for language and emotion. This book brings the perspective of brain science to the study of child-art in the context of art history and human development.

First, let's get a feel for the range of children's scribbles.

²⁹Kellogg, Rhoda, *Analyzing Children's Art*, figures on pages 14, 49, 56, 101, and 109 © 1969, 1970 by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

³³Fein, Sylvia, *First Drawings: the Genesis of Visual Thinking*. © 1993 by Sylvia Fein. Figures reprinted by permission of Sylvia Fein, January 22, 2003.

³⁴Fein, Sylvia, *Heidi's Horse*. © 1976 by Sylvia Fein. Figures reprinted by permission of Sylvia Fein, January 22, 2003.

Basic Scribbles

Scribble 1		Dot
Scribble 2		Single vertical line
Scribble 3		Single horizontal line
Scribble 4		Single diagonal line
Scribble 5		Single curved line
Scribble 6		Multiple vertical line
Scribble 7		Multiple horizontal line
Scribble 8		Multiple diagonal line
Scribble 9		Multiple curved line
Scribble 10		Roving open line
Scribble 11		Roving enclosing line
Scribble 12		Zigzag or waving line
Scribble 13		Single loop line
Scribble 14		Multiple loop line
Scribble 15		Spiral line
Scribble 16		Multiple-line overlaid circle
Scribble 17		Multiple-line circumference circle
Scribble 18		Circular line spread out
Scribble 19		Single crossed circle
Scribble 20		Imperfect circle

Scribbles and Meaning

“Basic Scribbles”, from *Analyzing Children’s Art*, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.

Out of these shapes emerge diagrams.

The Emergent Diagram Shapes

By the age of two, children generally put some of their scribblings into definite Placement Patterns, with the markings positioned in relation to the edges of the paper. By the age of three, children make Diagrams, with single lines employed to form crosses and to outline circles, triangles, and other shapes. Formations that may be called Emergent Diagram Shapes precede the Diagrams.

Left: E1, multiple line crossings which could have been made without lifting the crayon (26 months)



Right: E2, multiple line crosses which could only have been made by lifting the crayon (25 months)

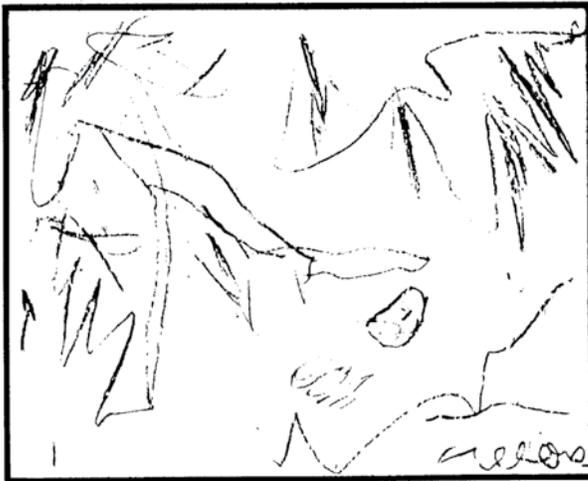


Left: E3, small crossings. Short lines cross other lines (27 months)



Right: E3, small crossings. Many small lines appear here (30 months)





E11, implied square shape (28 months)



E14, concentric markings (42 months)



E12, centeredness markings, in circular lines (26 months)



E12, centeredness markings, with crossing line (28 months)

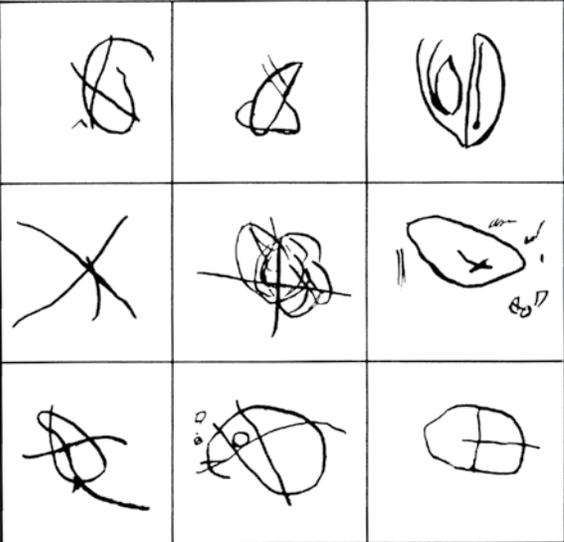
of E11 scribbles imply a rectangle that is well within the perimeter of the paper.

Markings in the center of a scribble, as in E12, and concentric markings, E14, suggest oval or circular Diagrams. In E13, E15, and E16, Diagrams are implied by the limits of the markings. A line drawn around E13 scribbles results in an oval or circle. In similar fashion, E15 yields an odd shape and E16 yields a triangle. Classification E17 is something of a catchall. I use it for scribbles in which a roving line takes in large areas. These scribbles show careful movement of the sort used in forming shapes, but no definite single shape is separately outlined.

The skeptical reader may have particular reservations about the implied shapes that I find in scribbles. If a child's paper shows a single circle made with a single line and there are no other markings on the paper, he has certainly perceived a circle, but why assume that he perceives circularity when his markings happen to fit inside a circle? Observations of children at work form one part of my answer. I have many times seen a child lift his crayon and place a final mark which shapes out a whole. Another part is the entire development of children's art as described in this book. The Basic Scribbles, the

The Combines

The emergent shapes become 36 combinations, or combines, and then 66 possible combines:

	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Pairs</th> <th style="width: 25%;">Separate</th> <th style="width: 25%;">Overlapping</th> <th style="width: 25%;">Containing</th> </tr> </thead> <tbody> <tr> <td>Rectangle and rectangle</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rectangle and oval</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rectangle and triangle</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rectangle and odd shape</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rectangle and Greek cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Rectangle and diagonal cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Oval and oval</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Oval and triangle</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Oval and odd shape</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Oval and Greek cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Oval and diagonal cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Triangle and triangle</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Triangle and odd shape</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Triangle and Greek cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Triangle and diagonal cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Odd shape and odd shape</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Odd shape and Greek cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Odd shape and diagonal cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Greek cross and Greek cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Greek cross and diagonal cross</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Diagonal cross and diagonal cross</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Pairs	Separate	Overlapping	Containing	Rectangle and rectangle				Rectangle and oval				Rectangle and triangle				Rectangle and odd shape				Rectangle and Greek cross				Rectangle and diagonal cross				Oval and oval				Oval and triangle				Oval and odd shape				Oval and Greek cross				Oval and diagonal cross				Triangle and triangle				Triangle and odd shape				Triangle and Greek cross				Triangle and diagonal cross				Odd shape and odd shape				Odd shape and Greek cross				Odd shape and diagonal cross				Greek cross and Greek cross				Greek cross and diagonal cross				Diagonal cross and diagonal cross			
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Attempted Combines (three years)

	+	□	○	△	☞	×
+	#	⊕	⊙	△	☞	*
□	⊕	⊙	⊙	△	☞	×
○	⊕	⊙	⊙	△	☞	×
△	△	△	△	△	☞	△
☞	☞	☞	☞	☞	☞	×
×	*	×	×	×	×	×

Thirty-six possible Combines (author's sketches)

Sixty-six possible Combines (author's sketches)

“The Combines”, from *Analyzing Children’s Art*, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.

Combines of Odd Shapes

Including combines of odd shapes

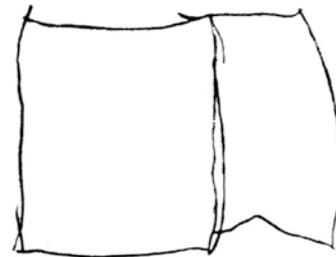


Combine constructed of odd shapes (35 months)

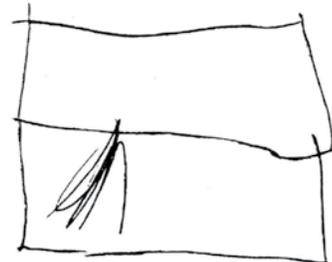
and the possibilities of analysis soon outstrip any likely developmental significance. Perhaps a computer could be programmed to classify the line formations in children's art in an exhaustive manner. Nevertheless the programmer's definitions would have to be arbitrary, and the result of the computation would deserve to be treated with some caution. Categories of line formations provide a way to approach the actual development of children's art, but the categories and the developer are not the same.

Combines of odd shapes (three and four years)

I have found that certain Combines are commonly made, and others are made rarely if at all. The Combines favored by children include



Combine of touching squares (35 months)



Combine of joined squares (35 months)

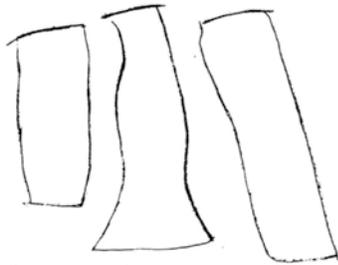


Combine of separate squares (35 months)

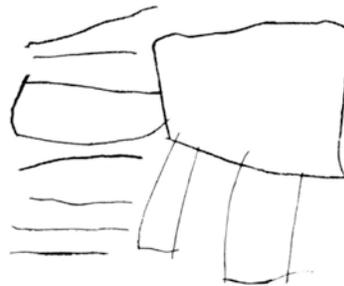
"The Combines", *Analyzing Children's Art*, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.

Saving Literacy

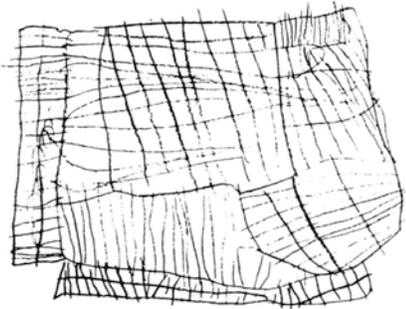
Children's scribbles produce aggregates as well as combines:



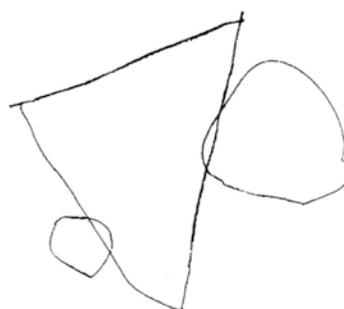
A2, Aggregate made of rectangles (37 months)



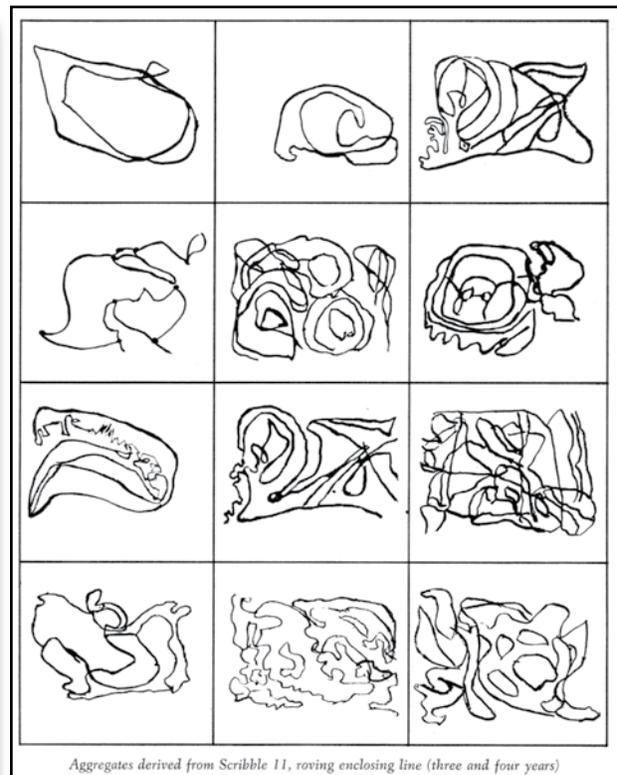
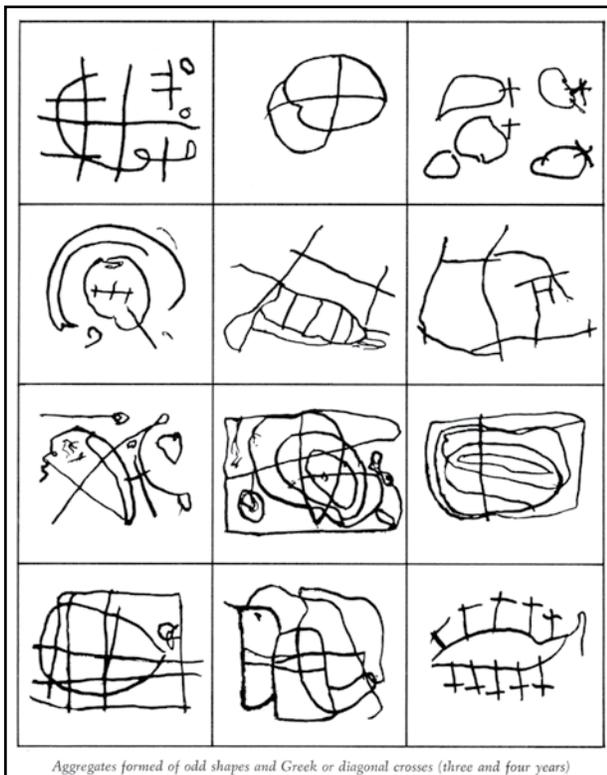
A2, Aggregate made of rectangles (41 months)



A8, multicrossed Aggregate area (48 months)

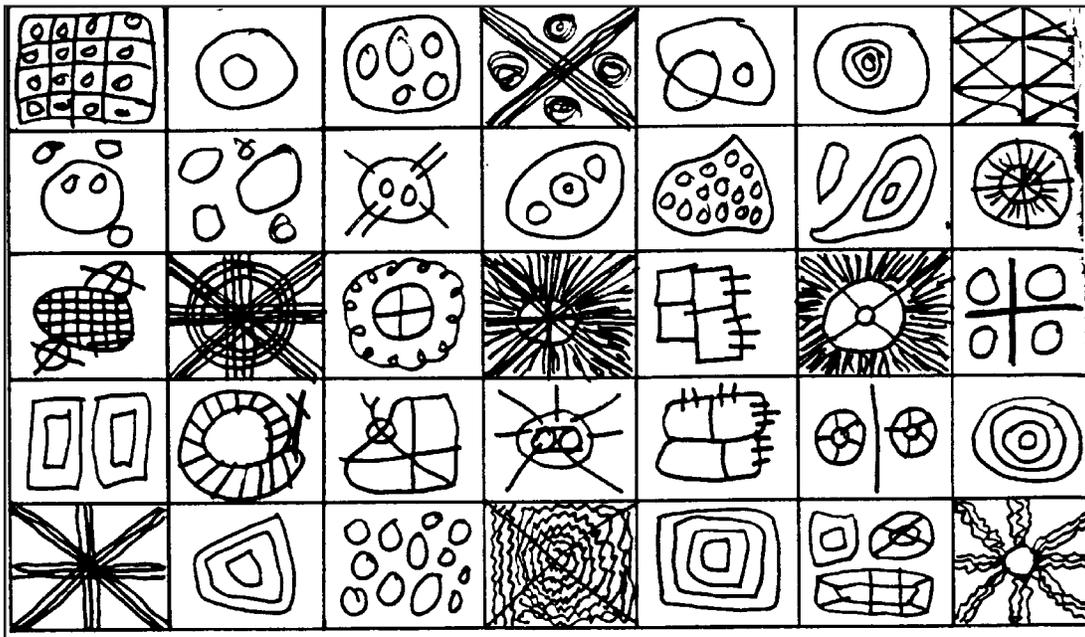


A9, formation of three Diagrams (37 months)

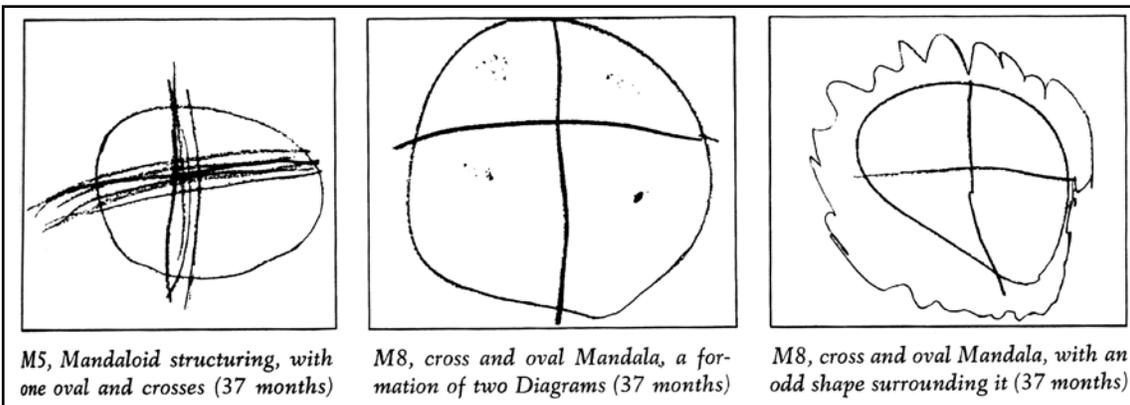
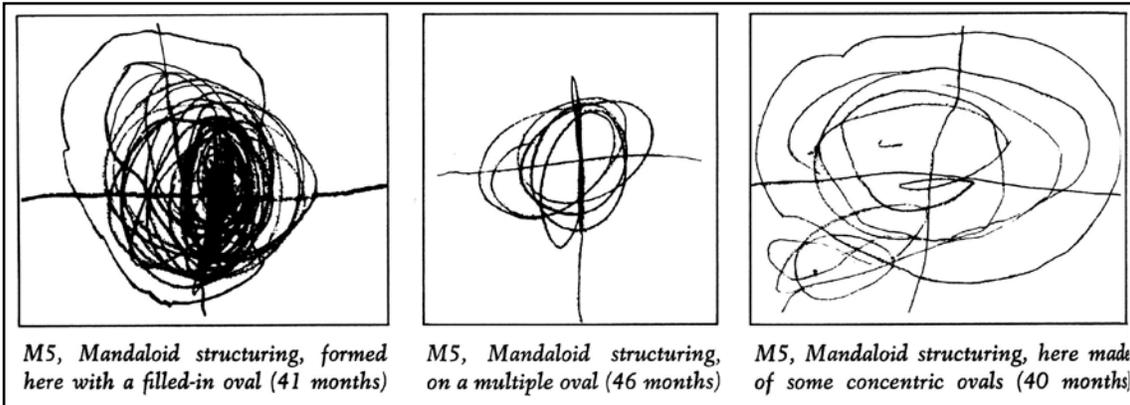


Analyzing Children's Art, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.

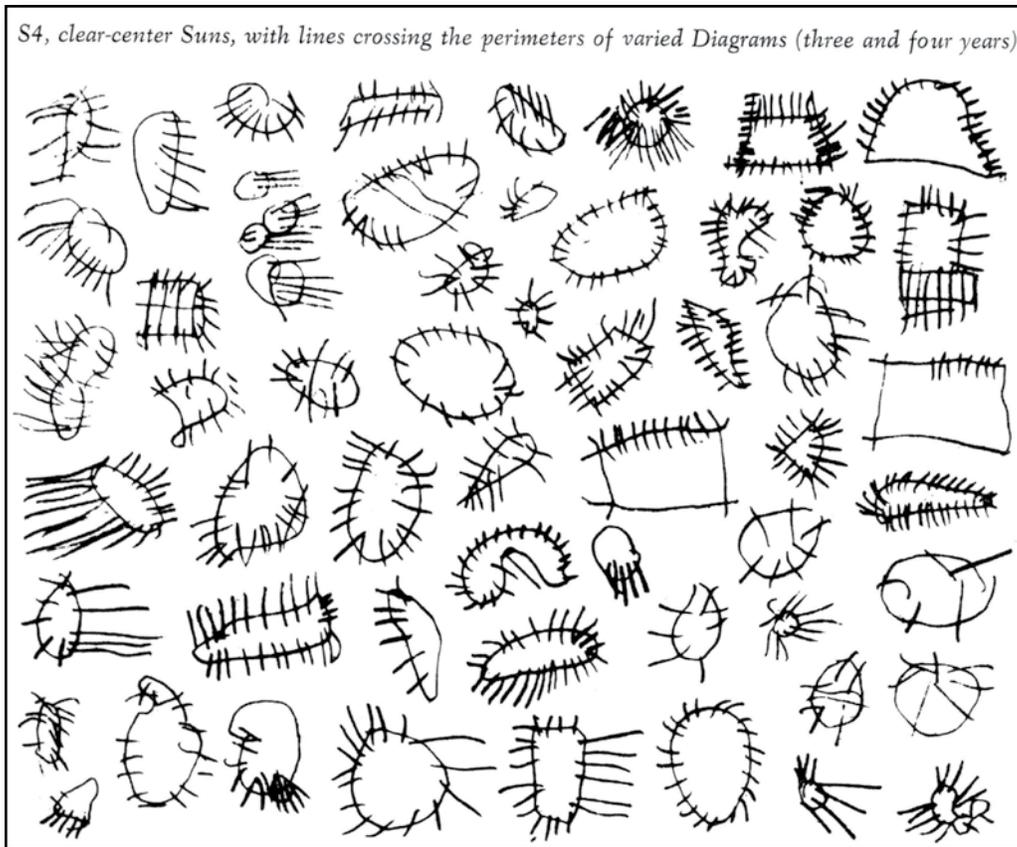
Aggregates and Combines:



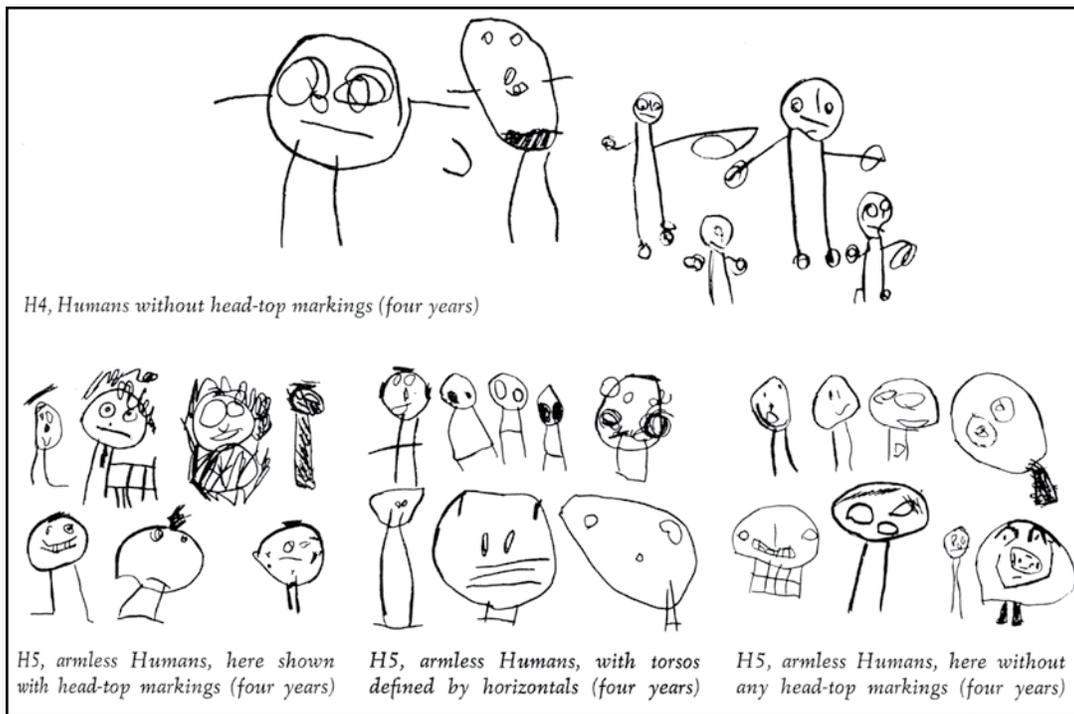
The mandala also emerges:



"Aggregates and Combines", from *Analyzing Children's Art*, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.



“The Range of Clear-Center Suns”, from *Analyzing Children’s Art*, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.

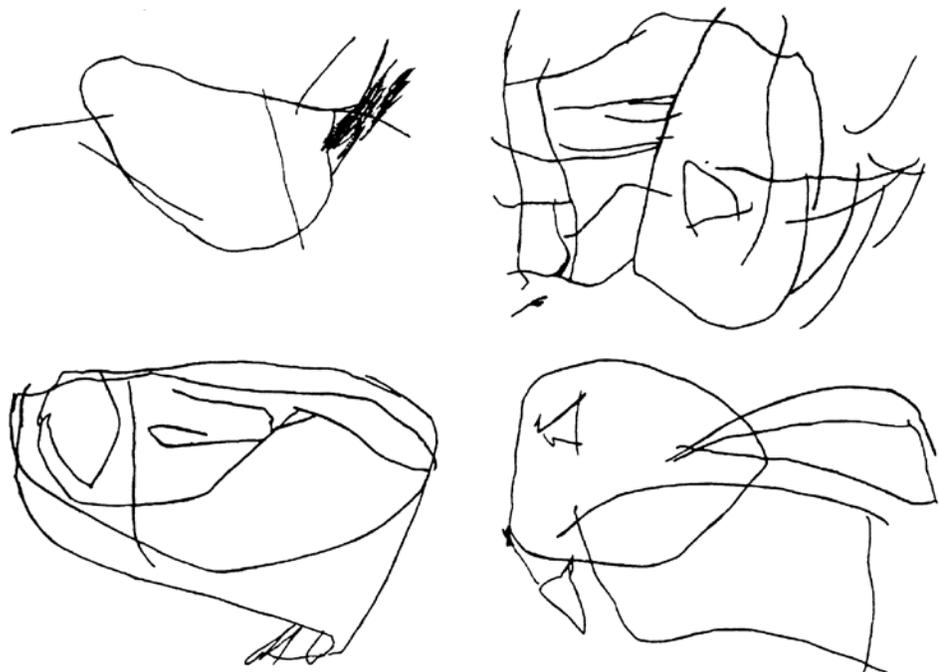


“The Range of Four Year Olds’ Humans”, from *Analyzing Children’s Art*, by Rhoda Kellogg, reprinted by permission of McGraw-Hill Companies, Inc.

Kellogg strongly supports the position that if children can produce mental images, they are expressing the kind of intelligence necessary for learning to read (1970, page 189). Kellogg feels that "art Gestalts" (as significant universal shapes and patterns), as well as "word Gestalts" (where a word is read as a whole, like a drawing, rather than as individual letters) are involved in reading. Fluent writers and readers of image and text produce and process wholes. Kellogg also believes that children's art "appears to be related to mathematical learning" as expressed by the "geometric aesthetic" in children's diagrams, combines, aggregates and mandalas (190). I believe that this geometric aesthetic sense precedes and supports mathematical sensibilities and intuitions (page 190; Deheane, 1997).

This book takes the position that this aesthetic sense, or sensitivity for shapes, depends upon the child's ability to access and organize the neural shapes of increasingly less chaotic, more coherent thought in it's own brain, and that this neural coherence is accessed and refined by scribbling and drawing. The "art Gestalts" which emerge in children's scribbles and drawings all over the world are universal. I believe that these Gestalts are universal because they are models or copies of neural patterns integral to the architecture of symbolic thought and, as such, are neural brain-based templates for spoken or written languages, as well as for all mathematical expression, for every genre and period in art, and for all musical composition from round to fugue (I expressed this idea in 2000, nine years before Freeman's enormously useful 2009 paper postulated special brain activity associated with symbolic reasoning deep within special brain tissue). Cross-species brain scans of developing young as they vocalize and gesture, act and react should clarify this position. The ability to represent the shapes of thought that are unique to the human mind most probably both determine and hinge upon speech and literacy.

Scribbles and drawings made by a malnourished child, (a refugee from the Nazi invasion of Holland) below show "mental deficiency." Kellogg notes, "There is no Mandala, no Sun and no Human and even the Diagrams and the Aggregates are poorly assembled." (199). The marks reveal brain damage.



Structures from the drawings of a malnourished child (36-54 Months) from *Analyzing Children's Art* by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

Scribbles and drawings reveal deficiencies. This book takes the position that scribbles and drawings may also prevent, correct and heal deficits and deficiencies.^{1,5,6,8}

Sylvia Fein's stages of scribbling with art historical mappings

Sylvia Fein's seminal and comprehensive book *First Drawings: Genesis of Visual Thinking* (1993), includes the work of children from age two to age six in the United States, Germany, Mexico and Guatemala. Her equally comprehensive book, *Heidi's Horse* (1976) gathers together her niece Heidi's horse drawings from age two to age fifteen. Both publications provide important standards for developmental stages in children's scribbling and drawing. As significantly, Fein's book *First Drawings* shows how each stage in children's scribbles maps onto profoundly significant shapes, patterns, designs and constructions devised by humankind over the long history of art to designate places and items of special, often spiritual significance. These art historical shapes, patterns and designs have been recorded in many places. As Fein states in the preface to her book, "These remarkable structures do not originate in the child's optical experience, but come from an inner imperative which presents them as appropriate and practical." (1993, xiii). Again, it seems most likely to me that children's drawings and humankind's art emerge from the same compelling neural wellsprings in the human brain.

Hints from Neuroscience

According to Sylvia Fein, there is some command, some set of instructions for mark-making in certain proscribed ways necessary to the life of the human child embedded in the very neural fibre of the organism we call human. These shapes are "appropriate and practical," because they will become the building blocks of the entire range of literacies humankind has devised to represent experience and meaning, boosted by the appreciable processing advantage conferred by visual-attentional spatial tasks on verbal language systems (Lesser, Lueders, Dinner, Hahan, Cohen, 1984; Pulvermuller, 1999; Coslett, 1999; Taylor, 1999; Wing, 2000; Grossberg & Paine, 2000; Jeannerod, 2001; Katanoda, Yoshikawa, Sugishita, 2001; Morsella & Krauss, 2003; Vandermeeren, Bastings, Good, Rouiller, Oliver, 2003, also in Sheridan, 1990). This means that the activities of scribbling and drawing helped the evolving hominid brain to write and read words and mathematical formulae and musical compositions, as it still does, child by child.

Other organisms are not compelled to draw Euclidean and Non-Euclidean structures. They may build Euclidean and Non-Euclidean forms (as the snail does, producing the spiraled nautilus or as the honey bee does, producing hexagonal chambers in the honeycomb), but they do not draw them. Isn't it strange that it became important in evolutionary terms for an organism to be able to organize its mental activity by drawing pictures of it's mental activity, then revising,

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁵Sheridan S.R. 2002. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy*; 22 (2):107-128 by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page att:<http://www.sciencedirect.com/science/journal/03069877>

⁶Sheridan, S.R. 2004. "Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness," *Toward a Science of Consciousness*, Tucson, abstract #209.

⁸Sheridan S.R. 2006. "Glossolalia, Consciousness states, and the mind/body benefits of fluent spiritual speech: Extending the purpose of linguistic experience." www.drawing/writing.com . Poster session, abstract 300, sixth *Toward a Science of Consciousness Conference*. University of Tucson, Tucson Arizona. Downloadable www.drawing/writing.com

extending and re-inventing these shapes and transporting them on the waves of energy we call light back into the visual cortex, and from thence all over the brain, for the sake of other kinds of internal images generated without external input, including any more marks? This visual thinking for thinking's sake is part of the recursive mental life of the organism we call "us." We look outside ourselves for information and answers, then we look inside ourselves and then we use that internal wisdom to look out, again, at the world. Our minds run back and forth between our brains and the world.

What funny brains we must have! How improbable. How fantastical! Movement that requires no bodily motion. Attachment needing no mouth or arms or legs. Communication through a medium that is never seen or heard except by the inner eyes and ears of the thinker.

The Developmental Stages of Scribbling and Drawing

Stages



Overview

I have organized Kellogg's and Fein's developmental stages of lines and shapes into Early, Middle and Mature, or High Stages of Scribbling --- in so doing, giving scribbling the dignity it deserves --- while providing guidelines for caregivers about their children's visual, emotional, and verbal growth during each stage of scribbling. I have done the same with Sylvia Fein's record of her niece, Heidi's, horse drawings, using them to illustrate

Note that each stage will include children of varying ages

Early, Middle and High Stages of drawing in children. No child will fit these stages of scribbling or drawing exactly and many will move back and forth between them.

Included within this organizational scheme are transitional stages which I call transformational stages, since they signal leaps in children's thinking. These stages are designed to help caregivers sort out the growth of their children not only in Kellogg's and Fein's terms of a visual grammar of thought, but in neural terms, proposing a marks-anchored set of cognitive benchmarks for growth spurts in visual, emotional and verbal development.

Note that each stage will include children of varying ages and remember that, at any age, a child can produce work that includes several stages. It is best not to think of stages as time-locked, but as fluid and dynamic. If I write a poem and go back to prose, no one is going to describe me as an adult writer who has regressed. In "Stories", you already met Maeve, a four year-old, who produces stick figures *and* non-figurative "scribbles". For her, scribbling is not regressing. Scribbling is a high form of mental play and if Maeve were an adult, we would call her work abstract expressionist, recalling the work of premier American abstract expressionist, C. Ronald Bechtle (1924 -), who is my mentor. Hmmm, Bechtle's work looks like Early and Middle scribbling to me!



Bechtle Painting "Light Lunch, Maine" xcv

Why do children scribble and draw? From the brain's point of view

I believe that little children draw Euclidean and Non-Euclidean shapes because these shapes cue a new stage in children's representational thinking. The spontaneous Euclidean and Non-Euclidean geometry in children's scribbles has to come from somewhere. Either geometry exists apart from the physical world, as Plato insisted, or it doesn't. If it's "Out There", apart from the



Will Hannay and his mother, Debbie 2006 © Hannay

physical world, how do toddlers know about it? If it's inside their brains, then Euclidean and Non-Euclidean geometry are such an integral part of the toddler's physical/mental life that her little pudgy hand and eye and brain effortlessly contrive such shapes. It's my guess that geometry is part of children's brains as both structure and process, essential to their Being and Becoming. These geometries must be neural and necessary for human brains that will speak and write. (If you do

not remember anything about Platonic forms or the difference between Euclidean and Non-Euclidean geometry, don't worry, you'll find out about them as you work through the exercises in this book.)

In some of my son, Sam's, earliest notebooks (with drawings from age two to four), there are nested or embedded and/or concentric circles that are similar to some of the petroglyphs in a Shoshone Indian outlook-cave on the Rose Tree Ranch in Southern Arizona where I used to live. I climbed to these caves, taking slides and making drawings to record and preserve these pictographs, which are perilously exposed to wind and weather.

Both sets of marks on the opposite page, Sam's and the Shoshone Indians', are also very like the concentric circles' found in Spain, Italy, Indonesia, and Peru dating from 5000 to 1000 b.c.e. How do toddlers access and replicate shapes of such art-historical importance?

Such shapes must be self-organizing for toddlers whose hands and eyes and brains are bent on symbolic meaning. Such organizational patterns are also probably necessary for biological life in general, but, apparently, for human linguistic existence in particular.



Rose Tree Ranch, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100- A.D. 1450. Elgin, Arizona. Author's photo



Sam, circular figures, age 3



*"This is me, Ben," Ben, age 2.
Ben is Sam's nephew. Sam is 26
years older than Ben*

*Nested circle, spiral, Indian Caves, Rose Tree Ranch, Elgin, Arizona, petroglyph
images, Hohokam Classic Period, American SouthWest, A.D. 1100- A.D. 1450.*

The Stages of Scribbling

S STAGES		<i>8-12 months, or up to 1 year</i> <i>Early Scribbling</i>
--------------------	---	--

In the first, or Early Stage of Scribbling, at about one year of age, children make a few marks (straight thrusts and emphatic dots), often without looking at them. Then, as marks catch their visual attention, children start to draw for longer periods of time, creating haystacks of lines and masses of dots. Initially, most children draw straight lines that go every which way, pushing with the marker or crayon, and jabbing dots.

S STAGES		<i>12-24 months, or 1-2 Years</i> <i>Middle Scribbling</i>
--------------------	---	---

In the second, or Middle Stage of Scribbling, between one and two years of age, children move away from helter skelter lines and dots to loops, nested loops, or loosely concentric circles, and the back-and-forth, up-and-down, in and out explorations called meanders, labyrinths and mazes.

S STAGES		<i>24-36 months, or 2-3 years</i> <i>Mature/High Scribbling</i>
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In the third, or Mature Scribbling Stage, between two and three years of age, children progress to controlled line explorations using spirals and a range of circles.

S STAGES		<i>Still at 24-36 months</i> <i>FIRST TRANSITIONAL/TRANSFORMATIONAL</i> <i>Stage of Scribbling: Heading into drawing</i>
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The Mature Stage of Scribbling is also a Transitional or Transformational Stage, occurring between three and four years of age, when children transform lines, dots, loops, circles, meanders, mazes, labyrinths and spirals into Euclidean and Non-Euclidean curvilinear shapes like circles, nested circles, and into linear (or non-curving, straight-edged) shapes, like triangles and rectangles and other parallel and/or perpendicular forms.

The Stages of Drawing

S STAGES		<p><i>36 to 48 months, or 3-4 years</i> Early Drawing</p>
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Verbally, this stage begins at about three; visually it can happen from about the age of three, also, but may not be evident until later. While attempting to represent the external world faithfully, the child is also intent on mapping that external world, via marks, back onto his own earlier attempts at drawing, as well as onto hard-wired, pre-existing internal shapes of thought.

S STAGES		<p><i>48 to 60 months, or 4-5 years</i> Middle Drawing</p>
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In my experience, from the ages of one through five years, children show a wide range of overlaps in stages of scribbling and drawing, while their spoken language-use may progress in a more or less linear manner.

S STAGES		<p>MATURE/HIGH DRAWING: 60-72 months, or 5-6 years or older. Representational and abstract drawing and the metaphorical child. Getting ready for reading and writing words.</p>
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The child is already reaching for new ways to say things, using images and words. Her drawings may be “surreal,” like Magritte (hyper-real in terms of accuracy, but weird in terms of juxtapositions) and her expressions may include visual and verbal metaphors, similes, hypotheses, analogies, predictions, and speculations. The Drawing/Writing Lesson Plans will lead you through these categories, both visually and verbally.

S STAGES		<p><i>60 - 72 months, or 5-6 years and beyond.</i> SECOND TRANSITIONAL/TRANSFORMATIONAL MARK-MAKING STAGE: Proto mathematics/music/writing</p>
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From about age five, the child will make marks that look like writing: printed lists, cursive script, the alphabet, numbers, musical notes. Left to her own devices as a mark-maker, it is highly likely that the child would invent her own mathematics and musical notational systems, probably before invented spelling.

S STAGES		<p><i>60-72 months, or 5-6 years and beyond.</i> THIRD TRANSITIONAL/TRANSFORMATIONAL STAGE Drawing/Writing</p>
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Your child is ready to become a balanced bilateral thinker, equally at ease with image, text, and image/text productions. Your child will have the visual-attentional capabilities to read books over hours or to decode electronic mixed media in seconds. Your child needs both skills and both speeds; to read images and text slowly for detailed content and to read images and text fast for overall meaning/message. Then the child needs to be able to make decisions about the usefulness or relevance of the details and the overall message.

Procedure for caregivers

Take note of each of these stages of scribbling as they occur. Write down your observations about the child’s visual, motor, verbal, social and emotional skills at each point in their mark-making development, glancing at the guidelines and benchmarks provided in the following pages. The benchmarks for behavior may not match up with the child. Trust the child. If, as happened



Ben, two-handed double spirals, age 3



Strange Attractor, Lorenz equation, Hugh Wilson, spikes, decisions and actions, page 176, 1999, Oxford University Press. This mathematical drawing is essentially like a child's two-handed, reversing spirals, suggesting overlap between mathematics and neural integration.

with Evan at age 1.5 (you read about Evan, in "Stories"), the child stops scribbling and talking entirely, you might have some cause for concern. Otherwise, trust that the child will scribble and draw, walk and talk, read and write when he/she is ready. Remember, though, that talking and reading and writing are learned behavior. Human children are taught to speak and read and write. They signal their readiness for language as literacy by scribbling and drawing. Just by listening to you speak is not enough to teach children to talk. They need to engage; they need to speak, too.

Spoken language may progress in fits and starts. My grandson, Ben, became almost mute after age one, ceasing to make much “verbal” noise at all except for the all-purpose sound “uuht.” By three years of age, Ben was talking “a mile a minute.” Still, he called me “Danny” instead of “Granny.” So, I needed a phonetic code to understand him. Remembering that g’s were d’s over the phone was a special challenge.

Still, at age two, Ben was ready to scribble, play make-believe and produce animal and engine sounds, even though he was not ready to speak much. He began to say sentences (“It’s dah” - for “it’s dark”) about the same time he drew with both hands, making two spirals, one which went clockwise for the right hand and one which went counterclockwise for the left hand, creating an image that looked startlingly like a mathematical Strange Attractor or a spiritually powerful design on the walls at Newgrange, Ireland, a design which I call “googley eyes” (Sheridan, 2001).

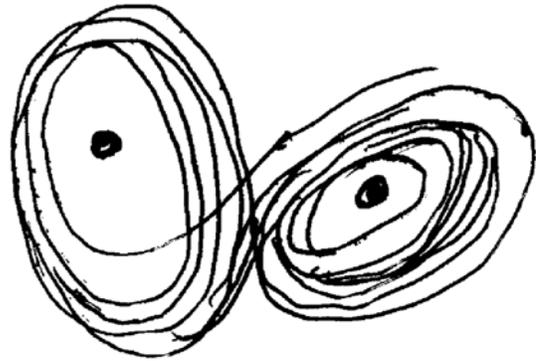
If mathematicians use a symbol that looks like connected reversing spirals to represent



Ireland

Carved with flint tools, two spirals are perfectly connected on this curbstone at Newgrange, in the Boyne cemetery, Ireland c5000bp.

"Double Spirals" from Newgrange, Ireland, Sylvia Fein, First Drawings, page 27, 1993, Pleasant Hill, CA: Axelrod Press.



Googley Eyes, "The Scribble Hypothesis," Sheridan, 2001



Ryleigh Thomas, © 2009, permission of her parents, Rex and Karey Thomas.

chaotic coherence involving two unsteady states in dynamic systems like, say, the bihemispheric brain, isn't it likely that Ben's ambidextrous drawing signals integrative neural development, say, between the right hemisphere and drawing and the left hemisphere and speech? So-called "brain gym" exercises (Eric Jensen, www.braingym.org) requiring the use of both hands in alternating activities are said to integrate brain activity across the hemispheres. Ben's bi-manual drawing on the preceding page surely reveals the same brain-integrative intent. The fact that this double scribble looks like a Strange Attractor - a mathematical location where numbers cluster to organize chaotic behavior - supports the possible connection between this special kind of scribble and coherent, self-organizing body/brain activity. Many scribblers use both hands to draw opposing spirals. If little children naturally do this, there must be a good brain-based reason. Little children are playful and spontaneous but they are mainly doing what their brain and body compel them to do, according to pre-set programs.

Scribbles must be self-organizing for toddlers whose hands and eyes and brains are bent on symbolic meaning. Such organizational patterns are also probably necessary for biological life in general, but, apparently they signal human linguistic activity in particular.

Such patterns and shapes of thought must align with the neural waves and patterns required for moving, connecting and communicating on human levels of symbolic thought. Deeper than the shapes of thought, such patterns recall the shapes of protein itself, the building block of life, biology's basic scribbles.

Drawings of circles and the concentric relationship between them is an ephemeral stage of the fragile early visual thinking of children. Not so with our ancestors, who wrung from the circle's essential form every intricate feasibility, leaving in all materials evidence of their thinking. What some modern observers call "abstract" was for them a reality impelled by human dictates of fitness and organization.



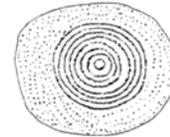
A rock at Carschenne, Switzerland covered with multiple ringed engraved concentric circles c2500bp.



Deeply carved concentric circles with depressed center, Pontevedra, Spain c5000bp.



One of many concentric circles carved in hillside rock, Camonica Valley, Italy c4000bp.



Australian Aborigine engraved stone churinga from the Macdonnell Range.



Detail of concentric circle pattern surrounded by dots on a cloth pubic belt, Ceran, Indonesia.



Concentric circle stamp, a symbol of royalty for the African Ashanti, carved from a calabash for printing on cloth.



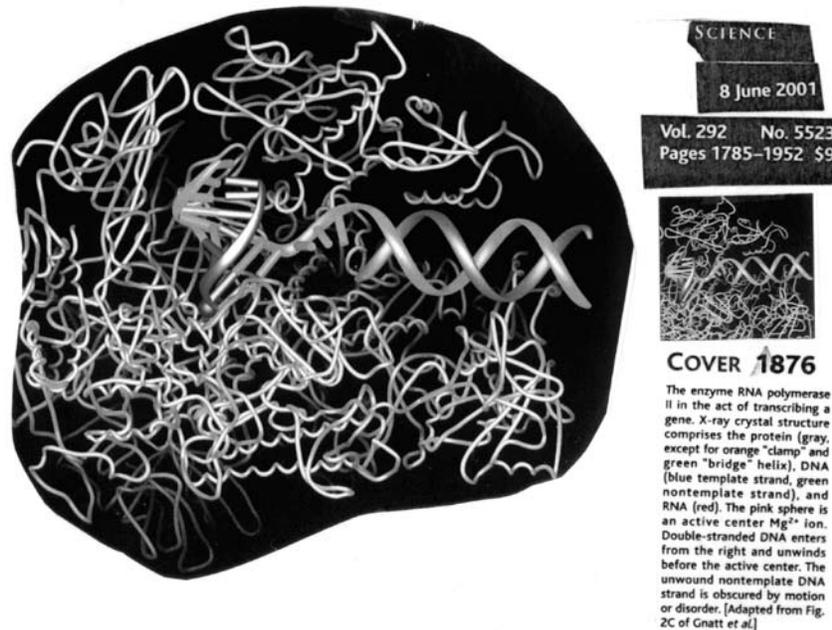
Painted concentric circles in white, yellow and red in a rock shelter at La Angostura, Baja California c500-1000bp.



Hundreds of concentric circles are painted in red and black on rock in a rotunda-like cave, Punte del Este, Cuba.



Pecked concentric circle on rock, Toro Muerto, Peru.



"The Protein called Scribble", from Science Magazine, Vol. 292, No. 5523, Pages 1785-1952

These significant neural processes, waves, sines, and shapes are also the substrates for the images most meaningful to us, the most freighted, and, ultimately, like the mandala (nested, concentric circles), the most spiritual. Coherent brain states in humans who are destined to make marks must either map onto mandalas or be very like them. Because our brain processes are continuous with other dynamic processes in the natural world around us, shapes which describe ocean waves, growing plants, spiraling sea shells, and other living things across macro and micro levels, down to sub-atomic levels, such recurring, universal shapes must organize our brains and bodies, too, as functional units. At this point, we can only hypothesize that the special geometry of human thought destined for speech and literacy has characteristic shapes, waves and sines that spring from universal biological and art historical, and mathematical and neural patterns.

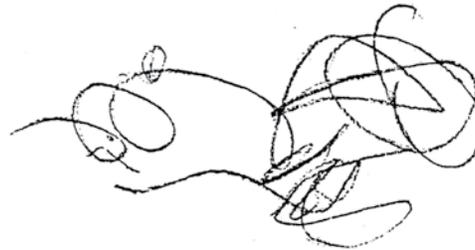
We need to understand that children's art is another form of literacy. We need to remember that finger painting with food in a highchair is where multiple literacies begin.

Scribbles

The first scribbles of two and three year old children are wild scrawls, sometimes punched full of holes. Having discovered that fingers can be instruments for making marks, children are quickly interested in crayons and pencils. As they sense potential control, their scribbles exhibit growth in coordination, judgment and clarity. They spend more time scribbling.



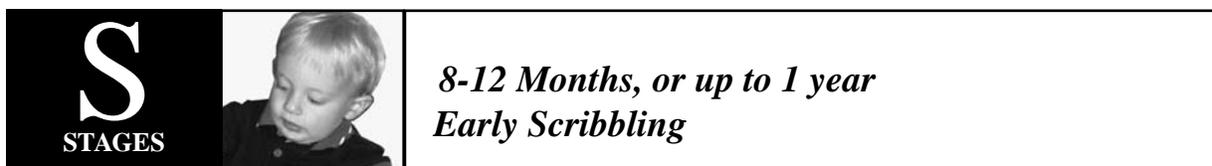
2 year old child



2½ year old child



*“Early Scribbling”, from **First Drawings** by Sylvia Fein, p. 12, Pleasant Hill, CA: Exelrod Press, permission by the author.*



What to look for, nurture and protect

The following developmental milestones for a child's first year are provided by Ronald McDonald Children's Hospital, Loyola University Medical Center. The corresponding descriptions of visual, emotional and verbal growth provided by the author, are painstakingly supported by research in my papers, dissertation, and books. If an assertion is unsupported by a footnote, then the assertion is original and the author's own.

Developmental milestones, end of first year, Loyola University Medical Center

Motor milestones - can sit alone, crawl on belly, creep, pull self up, walk holding furniture, may walk a few steps. (My grandson, Asa, is walking and running at 13 months. He has the freedom to move constantly, everywhere, under watchful eyes. The freedom to move and explore accelerates motor skills.)

Hand and finger milestones - uses pincer grasps, bangs two things together, puts objects into container, takes objects out, lets go voluntarily, pokes with index finger, tries to imitate scribbling.

Language milestones - pays increasing attention to speech, responds to simple verbal requests, using simple gestures, babbles with inflection, says "dada" and "mama", uses exclamations such as "Oh-oh!", tries to imitate words. (Children this age are also able to sign many words, talking with their hands.)

Cognitive milestones - explores objects in many different ways (shaking, banging, throwing, dropping), finds hidden objects easily, imitates gestures, begins to use objects correctly (drinking from cup, brushing hair).

Social/emotional milestones - shy or anxious with strangers, cries when the regular caregiver leaves, enjoys imitating people, shows specific preferences for certain people and toys, prefers the regular caregiver over all others, repeats sounds or gestures for attention, finger-feeds himself, extends arm or leg to help when dressing.

EARLY SCRIBBLING: Lines, dots.

Around one year of age, the child will scribble for the first time, for a second or two. The child will pay scant visual attention to the marks. The child makes them but does not look at them.

These scribbles will include straight lines going every which way, and, perhaps, some dots.

How the Stage of Early Scribbling relates to visual, emotional, and verbal growth, S. R. Sheridan

Visual growth - slight stimulation of the *visual* cortex by handmade marks, since the child may not be watching his mark-making with much attention. Doing it is enough for the *motor* cortex of the very young child whose hands are in the business of readying the brain not only for image-making, but for speech and literacy. Still, we know from research^{25,26} that the visual cortex is specially equipped to read the range of scribbled marks the child will produce. So, early scribbles must help organize the visual brain of the child for movement in the world, the same way the edges of furniture do. This early “blind” scribbling is still extremely important, operating as a neural organizer for the sensory-motor cortex, encouraging the two sides of the brain to move together, connect and communicate with each other, while creating the cortical spatial maps and motor maps on which speech will depend, as well as the spatial and motor maps upon which the manipulation of mental objects called marks of meaning, or literacy will depend. Such inter-hemispheric action and such “mapped maps”^{1,35} are the basis of the extra-special human strategies for movement, attachment and communication: speech and literacy.

Enjoys scribbling as a physical activity, in and of itself. Will engage in dyadic, back-and-forth shared scribbling sessions, embroidering on and drawing inside a caregiver’s marks. It is probably best for caregivers not to embroider on nor draw inside the child’s marks, lest they inadvertently take over the child’s process of drawing. The emotional encouragement should come for the child from the child’s own marks of meaning. Scribbles are pseudopods; they are like an organic “false foot,” allowing the child to reach out pre-linguistically, yet symbolically and emotionally, using hands, eyes, and positive feelings.

Emotional growth - early, brief interest in gestural mark-making as a positive experience, reinforced by parental approval, setting the tone for the child’s emotional relationship with the movement of marks on paper as a way to attach to and communicate with others.

Verbal growth - early, very brief interest in the action of the hand as a mark-making tool, preparing the brain for the action of speech, as well as the action of literacy. Because of ancient hand/speech connections demonstrated to exist on the sensory/motor cortical area devoted to both hands, especially the

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

²⁵Zeki, Semir. 1999 *Inner Vision: An Exploration of Art and the Brain*. London: Oxford University Press.

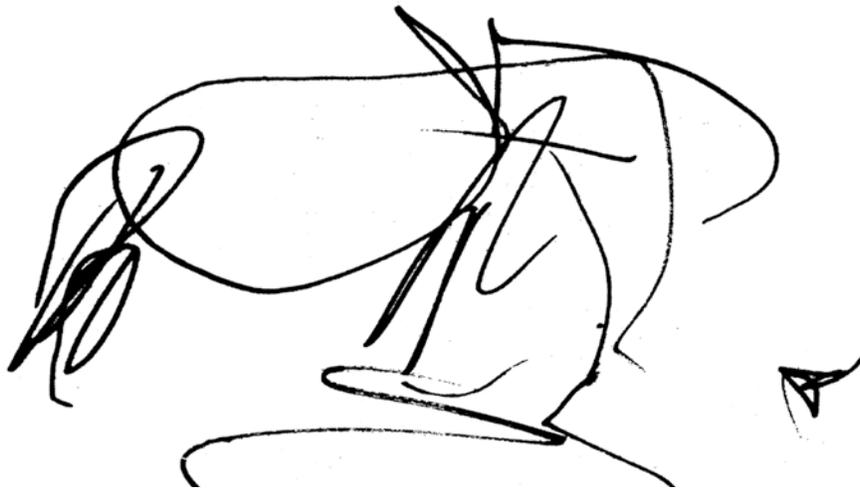
²⁶Zeki, Semir, 1999 "Art and the Brain," *Journal of Consciousness Studies*, Vol. 6, No. 6-7, June/July.

³⁵Meister I.G., Boroojerdi B., Foltys H., Sparing R., Huber W. Topper R. "Motor cortex hand area and speech: implications for the development of language." *Neuropsychologia* 2003; 41:401-406.

Examples of Early Scribbling:



Parker, age 4, scribbling with his Mom who has drawn around his scribbles



Valentine to Granny from Ben; note "near" triangle amidst the curving scribbles and a tossed-off proto-triangle, right-hand, lower corner.

dominant hand,^{1,35} we can infer that scribbling is a very early neural organizer for speech. Sucking, reaching, grasping, gesturing and scribbling operate as motor organizers for speech as speech itself has evolved as an ancient seeking mechanism that reaches out visually, motorically and emotionally. (Current support for pre-verbal children's fluency with sign language underscores the hand/speech connection.)

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

³⁵Meister I.G., Borojerdi B., Foltys H., Sparing R., Huber W. Topper R. "Motor cortex hand area and speech: implications for the development of language." *Neuropsychologia* 2003; 41:401-406.



What caregivers can do to help !

First and foremost, caregivers can make sure materials are available for scribbling and, secondly, they can notice and celebrate the fact that the child is scribbling, providing both opportunity and motivation for the mark-making which will become literacy. When the child begins to talk, you may want to add the child's words to the drawings. This will be important when you look back over your Field Notes to see how drawing and speaking developed together. Make sure you ask the child if it is all right to write his words on the scribbles and where to write the words. If the child is not talking yet, just show general interest in the marks. Do not offer your own interpretations or stories. If you do, you run the risk of suggesting that you know what the child's marks mean better than he/she does. If your goal is encouraging free imagination and a joyful spirit of independence in the child, resist interpreting the child's marks.

There is one substantive thing you can do at the early stages of scribbling and drawing with children; you can introduce them to a general vocabulary for lines and shapes. Even though you'll resist talking about what the child's marks mean, you can talk about the marks in useful ways. For instance, the formal properties of line include direction, shape, texture, weight:

Direction: A line can go up or down, ascend or descend, cut diagonally, sit perpendicularly, create obtuse (more than 90 degrees) or oblique angles (less than 90 degrees), intersect or not. A line can be over-lapping or non-overlapping.

Shape - Lines can be angular and abrupt, lines can be curving and continuous, flowing and extended or interrupted, staccato or smooth, Euclidean (having straight edges) or Non-Euclidean (having curving, organic, rounded sides), fractal (creating a whole from self-repeating modules which are self-similar across scales).

Texture - lines can be rough or smooth, thin or thick.

Weight - lines can be light or heavy, dark or light, thin or thick.

Lines also carry emotional meaning: they can be interpreted as weak or strong, harsh or kind, sad or happy, calm or angry, hopeful, nervous, erratic, dependable, tentative, forthright, aggressive or passive, elated or depressed. Think about the possibilities for the directions and shapes and textures and weights of lines described above. What kinds of lines might you associate with certain feelings? Art therapists and others who research line quality and universal meaning have identified certain kinds of lines with certain kinds of emotional states. Lines can organize information via webs and graphs, pie charts, nested lists, organizational outlines, too.

Be willing to label the lines in your own adult scribbles: straight, curving, diagonal, interrupted. You and the child will learn the vocabulary for lines and shapes used in art rooms, in geometry classes, in design classes, in architectural programs, in art history courses, in engineering programs, in math classes, in psychological assessments. Anyone who has taken a psychological assessment test knows that ease with seeing and drawing geometric shapes allows you to ace that part of the psychological evaluation. Simple mnemonic tricks like associating non-related pairs through images makes that part of the verbal-association intelligence test easy, too.

MIDDLE SCRIBBLING: Meanders, Labyrinths and Mazes

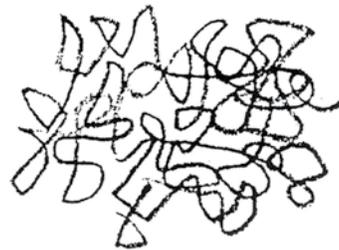
Meanders

Once put down, a line provokes thought.

Children quickly understand that they can make a line obey, and express this comprehension by “taking it for a walk”, unravelling the earlier scribbles. During their first pictorial wanderings demeanor is calm. Two and a half year old children now supplant the earlier exuberance of scribbling with thoughtful economy of effort.



Meanders by 2 1/2 year old children



In only a few minutes, the child becomes graphically more assertive. A purposefulness becomes discernible, hinting an impulse to make explicit marks. Lines acquire direction and sinuosity and purpose. Out of excess and randomness emerge limits and control. A mindfulness is needed to accomplish continuous roving loops and meanders.

Impelled by more than overwhelming kinesthetic energy, a three year old child no longer scribbles, but draws repetitive looping lines which exhibit plan and containment.

“Meanders”, from *First Drawings: Genesis of Visual Thinking* by Sylvia Fein, page 16, by permission of the author

Labyrinths and Mazes

Labyrinths, which are continuous, and mazes, which contain impasses, were used at least four thousand years ago in Egyptian building, possibly, it is said, to confound intruders. Labyrinths are also associated with “the complex pen that contained the dangerous half-human, half-beast Minotaur of Cretan mythology”.

Thoughtful evaluation suggests that the origin of mazes and labyrinths is from fortuitous and playful meanders, which throughout the world evolved from spirals and concentric circles into intellectual exercises, tortuous paths and puzzles. Some are rough, but most are precise, planned and purposeful, packing maximum turns into minimum space.



A three year old child drew these three separate coiling lines trying to keep them from crossing. She was unsuccessful. Her linear wanderings pushed out pathways whose destination she did not know; the travel was more important than the destination.



Our ancestors in Renegade Canyon, California c1000–3000bp also responded to the undulation of a meander doubling back without crossing, and chiseled two additional meanders between the spaces which remained.



Another child, greatly absorbed, drew these complicated labyrinthian lines also being careful to keep the lines from crossing other lines as they moved in a circuitous route. After finishing the drawing, the child darkened the starting point and returned to play without a word to celebrate his accomplishment.

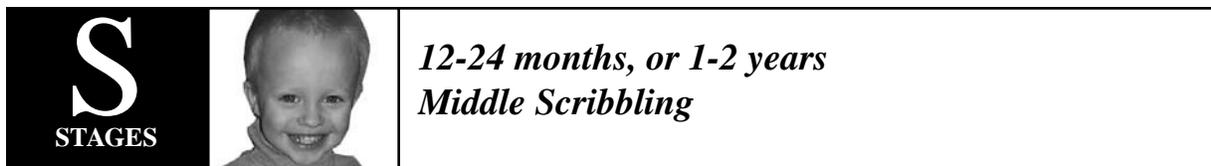
S STAGES		<i>8-12 months, or up to 1 year</i> <i>Early Scribbling</i>
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Name: _____ Date: _____

Child says about this drawing: _____

insert photo
of your child

Developmental Stages



What to look for, nurture and protect

Developmental milestones, end of second year, Loyola University Medical Center

Movement milestones - walks alone, pulls toy behind while walking, begins to run, stands on tip toes, kicks a ball, climbs onto and down from furniture unassisted, walks up and down stairs holding onto support.

Hand and finger milestones - scribbles spontaneously, turns over container to pour out contents.

Language milestones - points to an object or picture when it is named for him, recognizes names of familiar people, objects and body parts, says several single words by 18 months, uses phrases by 24 months, uses 2 to 4 word sentences, follows simple instructions, repeats words overheard in conversation.

Cognitive milestones - begins to sort by shapes and colors, begins make-believe play.

Social milestones - imitates behaviors of others, especially adults and older children, increasingly aware of himself as separate from others, increasingly enthusiastic about the company of other children.

Emotional milestones - demonstrates increasing independence, begins to show defiant behavior, episodes of separation anxiety increase toward mid-year, then fade.

MIDDLE SCRIBBLING: Lines, loops, nested loops, loosely concentric circles, meanders, labyrinths and images.

How the Stage of Middle Scribbling relates to visual, emotional and verbal growth, S.R. Sheridan

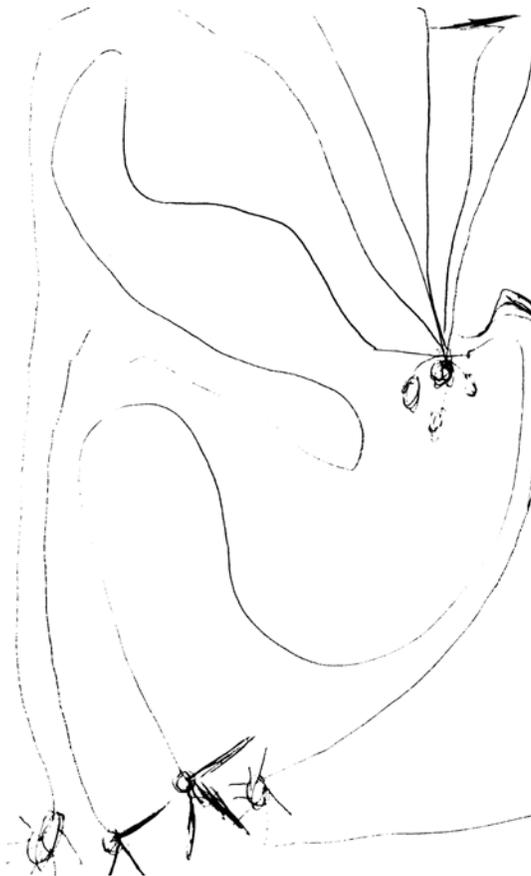
Visual/attentional growth - The child can sustain visual attention for longer periods of time when scribbling, continuing to train his visual cortex to determine where one shape stops and another begins. Instead of being scattered and disconnected, like broken strands of spaghetti or connected in

cross-crossing ways, scribbles have become continuous, with even ups and downs, creating wavy patterns or loop back and forth, creating meanders. Meanders, labyrinths and mazes can be drawn without crossings, creating clear “paths”. These scribbles reflect increasing control with hand-and-eye-directed, marks-based thinking and most probably create processes and structures very much like the actual wave forms and neural patterns of pre- and peri-literate thought.

Emotional growth - is beginning to feel interest and pleasure with mark-making as a complicated and challenging journey/adventure for the body and the mind with paper and marker.

Verbal growth - can recognize a spoken word that fits a drawing in a book and may name or describe his scribbles using one word or a few words.

Example of Middle Scribbling



Parker, age 3, a curving, looping maze with a embedded object, and wheeled, starred appendages.



What caregivers can do to help !

The caregiver can draw beside the child, talking quietly to himself or herself about her own adult drawing, while taking a general interest in the child's work, being careful not to overwhelm the child with chatter. At this point, any adult talk should include words about the formal properties of line and shape (thick, thin, diagonal, straight, curved), uttered quietly to avoid interrupting and distracting the thinking/mark-making of the child. As soon as the child starts to talk about his drawing, the caregiver should listen, using open-ended comments like: "Hmmm, I see, ah-ha."

MATURE HIGH SCRIBBLING: Spirals and Circles

Spirals

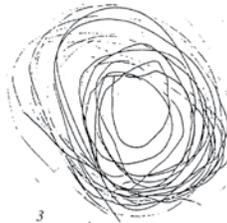
Spirals are our first ordered curves and first parallels.

They are ubiquitous and have an extraordinary place in artistic thought. They beguiled our ancestors perhaps because they are restless, dynamic, intellectual: roving vagabonds which entertain all manner of intricacies. They are simple, formal, orderly, adaptable, expandable, and provide an infinity of puzzlements.

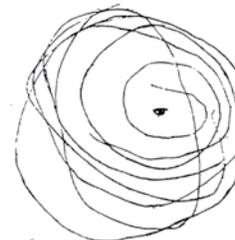
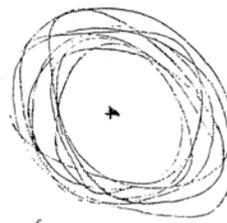
1, 2 Two, three, and four-year-old children now begin to transform their tangled webs of lines. Crossing randomly, meandering and snarled with loops and rhythmic doubling back, a nest of multiple lines at first appears to be a regression to a matted chaos.



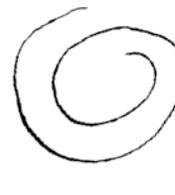
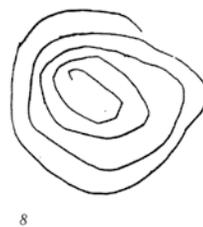
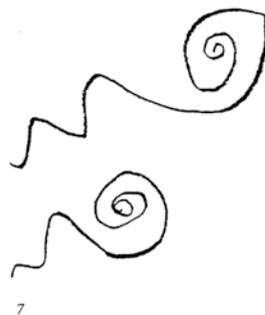
3, 4 But a difference may be observed in these drawings of children two and three years old: the line moves continuously in one spiralling direction, a first great directed arm movement.



5, 6 The spiral lines begin to produce a vortex. Some children respond to the space within the coiling lines and delineate its center with a mark, preparing themselves for developments yet unknown.



7-9 In a fleeting moment, the reiterated rotation of the scribble diminishes and a coil forms from fewer and more deliberate lines. To space the lines, the child calculates the equality of the distances between the expanding coils, controls direction and establishes an order which begins to preside over earlier less critical enthusiasms.



Developmental Stages

“Early Spirals as Ordered Curves, Concentric and Nested”, from First Drawings: Genesis of Visual Thinking by Sylvia Fein, page 8, by permission of the author

Connected Spirals

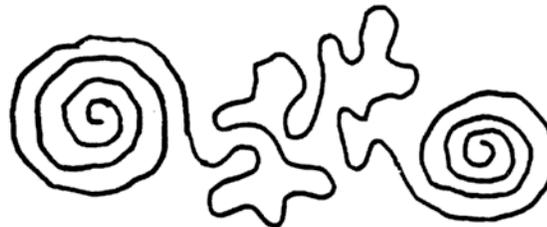
After discovering single spirals, children do not develop their complexities as did our ancestors. Children use small spirals to represent complex forms: hair, ears, eyes, buttons and fabric patterns. The spiral is a comfortable regression to cope with artistic difficulties beyond the child's ability, but children do not imbue it with mystic or ceremonial significance.

Our ancestors used two connected spirals rotating in the same or in opposite directions much as they used single spirals, and gave them many meanings: wind, whirlwind, relationship of earth and heaven, waxing and waning of the moon, birth process, fecundity, eternal life, horns of the bull, inhalation and exhalation of humans, oculi, the universe and whatever other characterizations suited their many purposes. For them, spirals had qualities that dealt appropriately with the supernatural: mysterious, incomprehensible, phenomenal and questionable. The spiral and the circle have always been the stuff of myths and stories. The spiral's primordial importance as mankind's first intellectualization of the scribble is obscured by the multiplicity of other significances ascribed to it.



Egypt

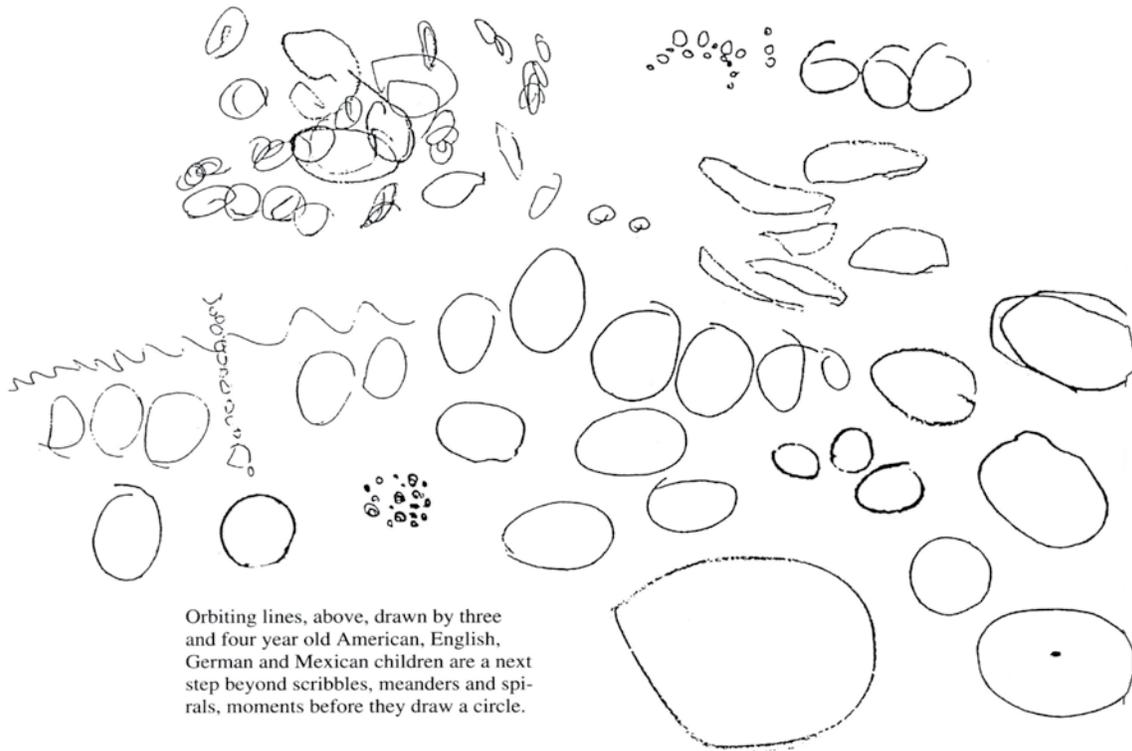
An Egyptian painter-hunter c6000bp attempted to link three spirals. The two left spirals were easily connected with a meander joining their free peripheral ends. Another meander bridging the space between the right spiral's free end and the central spiral's periphery makes the three spirals appear connected. If the painter had been able to double the coils at the spirals' nuclei the result would perhaps have been a free flow of lines.



Panama

Prehistoric Rock engraving at Río Mono, Panama, linked two spirals with a convoluted meander.

It is in the spiral that our children and our ancestors discover circular formations. Out of the grand arm movement and the regulated coiling of the spiral lines, a central space develops and an area is enclosed for the first time. A figure is manifested against a ground.



Orbiting lines, above, drawn by three and four year old American, English, German and Mexican children are a next step beyond scribbles, meanders and spirals, moments before they draw a circle.

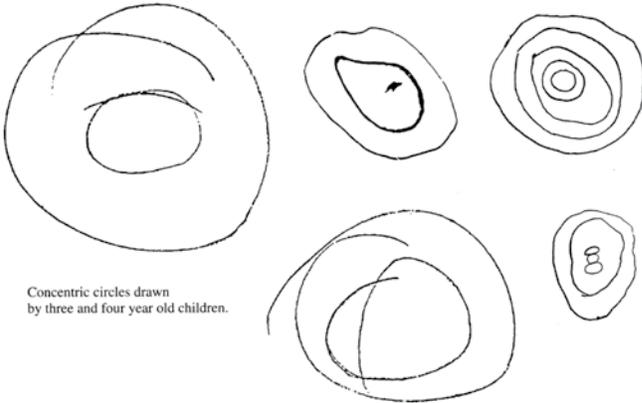
Circles are symmetry, an equal extension from side to side. They too may be exploited and enriched by variations and combinations, and children choose the circle rather than the spiral for this exploitation: circles large and small, bold and tentative, circles inside circles, circles surrounding circles, and even a few perfect circles, a feat for which Leonardo da Vinci received praise.



"Circles, Simple and Embedded", from First Drawings: Genesis of Visual Thinking by Sylvia Fein, page 42, by permission of the author

Concentric Circles

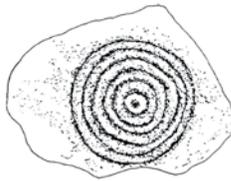
As children nest circles inside circles, the concentric and diminishing alignment identifies a center as it did for the spiral. The intensity with which three and four year old children draw circles when they discover them manifests their growing need to order chaos with a shape they understand visually. They savor their new endeavor, but this intricate development of intellect passes with little notice.



Concentric circles drawn by three and four year old children.



Multiple concentric circles pecked into basaltic rock in southern Oregon retain traces of red paint.



Slab engraved with concentric circles found in a burial chamber at Cairn Holy, Scotland c5000bp.

*“Concentric Circles”, from **First Drawings: Genesis of Visual Thinking** by Sylvia Fein, page 44, by permission of the author*

Concentric Arcs

Once the circle is exploited, parts of it are used as parallel curving lines which become a new and useful form.



This crayon drawing of ten curving parallel lines was done by a three year old boy a few days after he had stopped scribbling and had begun to draw loops, spirals and circles.

*“Concentric Arcs”, from **First Drawings: Genesis of Visual Thinking** by Sylvia Fein, page 50, by permission of the author*

Circles with Radials

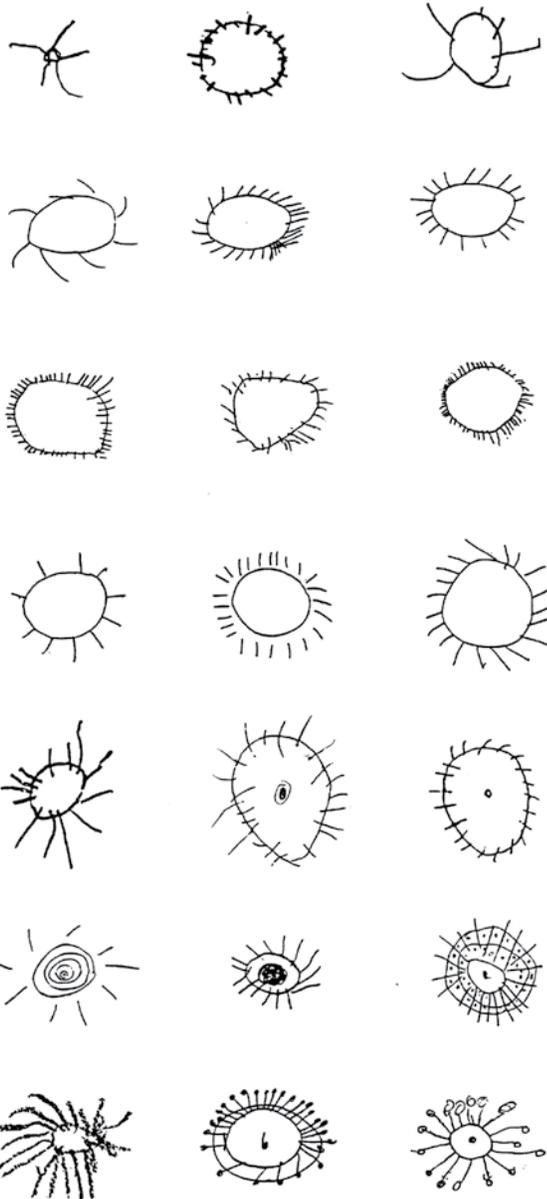
Achievement of clarity in constructing circular formations against an undelineated ground provides security and encourages innovation. The next discovery is that lines can be drawn toward or away from the circle's center.

What impels this new direction which every child takes, as did our ancestors? Is it a pull of logic felt between the circle's center and its periphery, a desire to bridge the distance? Children are not taught this formation but arrive at it instinctively without a model. They accompany this experimental linear expansion with little joyful shouts and exclamations. Did our ancestors feel a similar exhilaration?

At first, our children and our ancestors dress the circle's periphery with lines random and casual, sometimes in profusion, sometimes sparse. Exploration and exploitation beget variations with the newly introduced radials: small circles with space along the periphery for only a few lines; large circles with many lines; and circles with short, long, bold, tenuous, thick and thin lines, some ending in small spirals or circles. Occasionally the relationship between the circle's center and its periphery is noted with connecting radials and a visible central mark.

Gradually the radial lines become more erect, touching the circle's periphery at a ninety degree angle, a structural relationship which will soon be more fully developed.

Children three, four and five years old made these drawings.



Developmental Stages

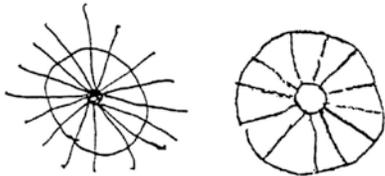
"Circles With Radials", from *First Drawings: Genesis of Visual Thinking* by Sylvia Fein, page 52, by permission of the author

Circles with Aligned Radials

Until now radials were outside the peripheries of circles or between outer circles with each radial drawn relative only to the radial which preceded it.

This changes, and the lines which now make a new orderly departure from the circle permit constructions independent of it.

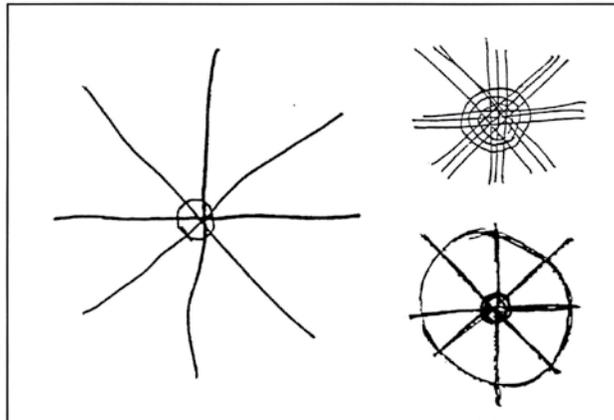
When three and four year old children draw perpendiculars inside the circle, it hints at a relationship between the periphery and the nucleus which is noted as a dot or small circle.



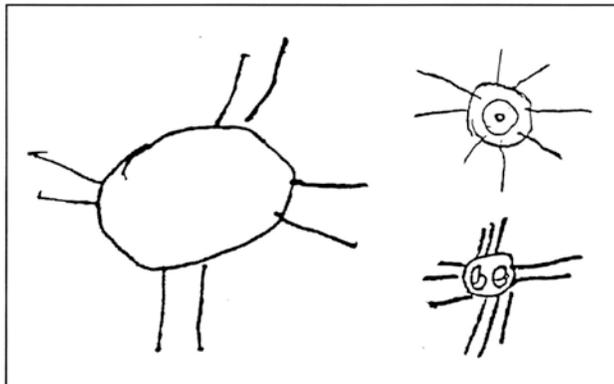
Children sense a directional compatibility between radials on one side of the circle and those on the other, and begin to align them even though they do not yet pass through the center.



Having identified the possibility, children draw perpendicular radials that align at a nucleus or are drawn straight through the nucleus and out the other side, even without the presence of the circle!



The number of lines passing through the nucleus is reduced to four; one child, in a show of bravado, tripled each of the lines as they passed through concentric circles.



Children no longer pass lines through the circle's center in order to align radials. They discover parallel linear relationships which they soon use to draw people and animals.

Both Fein and Kellogg comment on the significance of the quadrisected circle, or the mandala as an especially integrative form (Fein, page 58) and as an especially important transitional form between scribbling and drawing, in particular in connection with drawing the human form (Kellogg, page 65). So, when you see it appear, cheer!

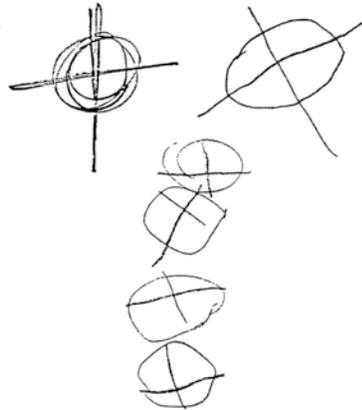
The Circle Quadrisected

The circle now has within its borders a powerful rival, the perpendicular. This maximum contrast of line developing in the circle creates new spaces and possibilities. In first drawings, they are vigorous and useful components and opponents.

Artists have always used perpendicular crossing lines inside circles in all materials and techniques and we may consider the form an early and universal manifestation of human configurative thought. It too has been accorded many meanings. Story tellers, modern writers, academics and psychological analysts provide myriad speculations as to its importance and symbolism.

The quadrisected circle too has been rhetorically related to sun worship, to the four corners of the cosmos, to the four cardinal directions, moon phases, the four seasons, the finite, the infinite and eternity. The vertical line is said to mean male or God, the horizontal line to mean female or Earth, and their perpendicular crossing a fusion of man and woman or a harmonious combination of God and Earth. In Egyptian hieroglyphics the perpendicular intersection of lines forms parts of words like wealth and happiness, and is considered a representation of life and living.

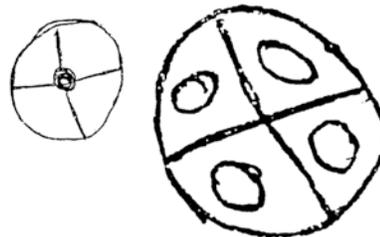
These meanings long precede the most prominent modern meaning humanity has accorded the cross.



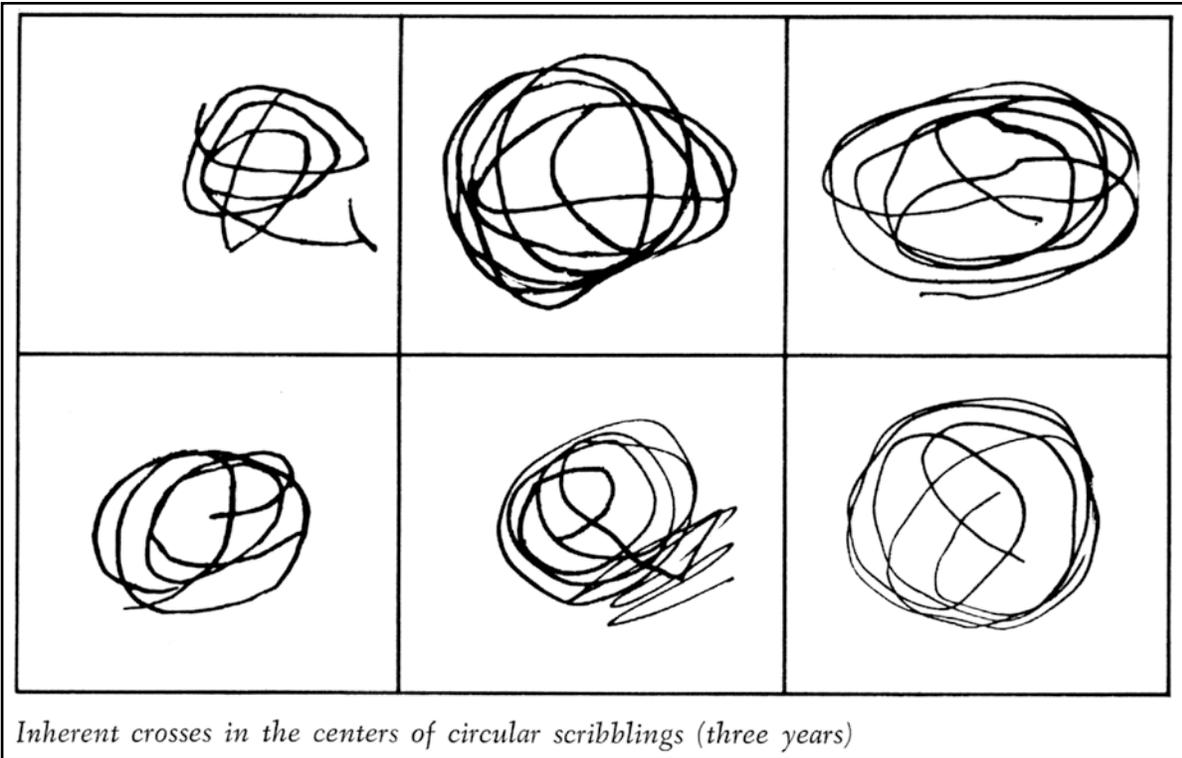
When the novelty of connecting lines across the circle's center subsides, repetition counsels more judicious reduction to a single perpendicular crossing. Children, three, four and five years old boldly quadrisection the circle.

Other children experiment with delineating the circle's center and acknowledge the quadrants by decorating them with small circles.

The quadrisected circle has also long been called a "mandala". Carl Jung says it plays a role in the "integration of personality" because it is the child's "first made Human (not a man, for the figure has no age or sex characteristics)." Calling it a mandala has the virtue at least of vaguely relating Jung's view of human development with artistic cognition and development.



"Circles, Quadri-sected", from *First Drawings: Genesis of Visual Thinking* by Sylvia Fein, page 58, by permission of the author



“Mandalas With Inherent Crosses in Center”, from *Analyzing Children’s Art* by Sylvia Fein, reprinted by permission of McGraw-Hill Companies, Inc.



What caregivers can do to help !

Listen to the child’s stories. Use open-ended, non-judgemental support: “Hmmm, I see, ah-ha.” Interested sounds will encourage the child to keep examining the drawings, extending the story, generating more words. If the child is searching for a word, you might provide it, ask if he thinks that word might work, then if you get the o.k., invite the child to repeat it and then say it again in a positive, easy, conversational manner. In this way, you can gently add to the child’s vocabulary. Ask the child if he or she would like you to write the new word on the page. Let them show you where to put the word.

Don’t hog the limelight by telling stories about your own drawings. If the child asks about your drawing, you might say, “Well... (long pause).. What do you think my marks are saying?” In this way, you encourage the idea that marks carry meaning, all kinds of meaning, in all kinds of ways and that the child is capable of figuring these meanings out and that you are very interested in what he/she is able to figure out. This open and relaxed attitude of yours will help set a positive emotional tone for the life of the child as a capable, effective talker and thinker.

S STAGES		<i>12-24 months, or 1-2 years</i> <i>Middle Scribbling</i>
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Name: _____ Date: _____

Child says about this drawing: _____

insert photo
of your child

Developmental Stages

		<p><i>24-36 months, or 2-3 years</i> <i>Mature/High Scribbling</i></p>
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What to look for, nurture and protect

Developmental milestones, end of third year, Loyola University Medical Center

Movement milestones - climbs well, walks up and down stairs, alternating feet, kicks ball, runs easily, pedals tricycle, bends over easily without falling.

Hand and finger skill milestones - makes vertical, horizontal and circular strokes with pencil or crayon, turns book pages one at a time, holds pencil in writing position, screws and unscrews jar lids, nut and bolts, turns rotating handles.

Language milestones - follows a two or three component command, recognizes and identifies almost all common objects and pictures, understands most sentences, understands physical relationships (“on”, “in”, “under”), uses 4 or 5 word sentences, can say names, age and sex, uses pronouns (I, you, me, we, they) and some plurals (cars, dogs), strangers can understand most of his words.

Cognitive milestones - makes mechanical toys work, matches an object in his hand or room to a picture in a book, plays make-believe with a doll, animals or people, sorts objects by shape and color, completes puzzles with 3 or 4 pieces, understands concept of “two”.

Social milestones - imitates adults and playmates, spontaneously shows affection for familiar playmates, can take turns in games, understands concept of “mine,” and “hers”.

MATURE/HIGH SCRIBBLING: Continuing line explorations, spirals, circles

From approximately 2.5 to 3.5 years of age, the child builds the entire visual vocabulary necessary for writing every language, all of mathematics, including geometry, all music, all art and, as languages are implicated, computer technology, integrating the energy of her body and her mind in special, linguistic ways.

How the Stage of Mature or High Scribbling relates to visual, emotional, and verbal growth, S.R. Sheridan

Visual growth - The child's ability to sustain visual attention for marks continues to grow, allowing it to access and transcribe the shapes of increasingly verbal and visual literate thought. The child is using his body as a central pattern generator and organizer. As a central pattern generator, the body/brain of the child is using external gestures, like drawing a spiral or a maze or a labyrinth, to both stir up and create brain patterns necessary for coherent thought and action. Some of these patterns are shared by other mammals. For instance, the neural image of a rabbit recognizing the smell of a carrot is a spiral. But rabbits do not draw spirals. Their brains experience them.²

Emotional growth - The child will say he/she "loves" to scribble and draw and will want to talk about his or her scribbles and drawings. At the same time, the child may begin to be self-critical about the content of the scribbles or drawings (see Parker Phillips Allen at age 4.5 in "Stories About Mark-Making"). Be supportive and encouraging. Find out what the child thinks is wrong with the drawing. Let the child accept it or fix it. Specific drawing solutions were effective with Wesley (you met Wesley, in "Stories" - remember the challenge of drawing steps and roof in a subway? But the situation was dicey. Wesley could have been intimidated by Donna's demonstration of how to draw a staircase and given up).

Verbal growth - The child can tell stories about the scribble-drawings and speculate about them, using many words. Encourage this. Listen. The child is practicing thinking using words and pictures. It's what humans do and what other primates don't. As marvelous as apes and chimpanzees are, the child is not a chimpanzee, nor an ape! She's showing you that she's a little human by scribbling in Middle and High Stages, as well as by talking.



Example of Mature/High Scribbling



Sam, age 3

At age three, in 1970, Sam drew this set of embedded circles, bisected. This is not a typical early drawing of a human nor of a mandala. But it belongs in the High Period of Scribbling because of embeddedness and bisectedness.

²Freeman, Walter J.; Broadhead, Peter. 1991. "The Philosophy of Perception." *Scientific America*, Feb. 11, 1991. pp 78-85.

S STAGES		<i>Still at 24-36 Months</i> <i>FIRST TRANSITIONAL/TRANSFORMATIONAL</i> <i>Stage of Scribbling: Heading Into Drawing</i>
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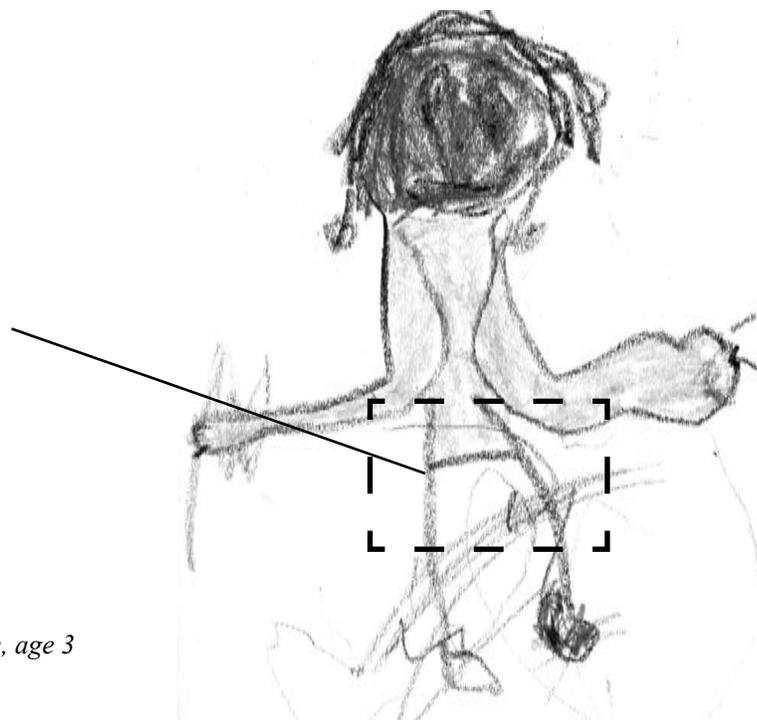
HIGH SCRIBBLING AND TRANSFORMATION

I believe that the Mature/High Stage of Scribbling is both transitional and transformational and occurs when talking, including story-telling and when elaborated drawings like circles, nested circles, perpendicular and horizontal shapes overlap. The ability to draw two parallel lines occurs in the transition from High Scribbling to Early Drawing, and the bisecting of space that occurs in the mandala-circle as bars between parallel lines signals this transitional High Scribbling to Early Drawing phase. Sam has actually combined, at age three, a more or less realistically rendered human head, shoulders, arms and body with stick figure legs, combining drawing and geometry.

From approximately 3.5 to 4 years of age, the child builds a visual vocabulary from scribbles to represent ideas and things graphically - that is, moving from scribbles to pictures that look or feel like the world around him. Look at the images on the following page which Sam drew at age three and four. See how the parallel lines in ovals develop into more easily accessible drawings of a human (more accessible for us) and, on the other hand, in "Artistry Mountain of the first New Year People," less accessible to us.

The child starts to care about matching up marks and meaning. How the child does this is up to the child. Try not to offer suggestions, like how to do one- and two-point perspective just because you know how or shaded drawings just because you know how. See what the child can

Perpendicular Lines



Sam, perpendicular figure, age 3

devise. Remember, you are mainly interested in how the child thinks visually and verbally, not in how you think visually and verbally. As you work through the Scribbling/Drawing/Writing process, you will have ample time to explore your own mind, visually and verbally. Caregivers are not left out of the process! They just do not dominate the child's process.

Examples of Transitional Figures in the High Stage of Scribbling as it moves into Early Drawing

Sam "papoose" or complex aggregate age 3



Sam, head, or figure in oval with horizontal, parallel lines in another "papoose" aggregate.



Sam's "Artistry Mountain of the First New Year People," (age 3)

How the FIRST TRANSITIONAL/TRANSFORMATIONAL Stage of Scribbling relates to visual, emotional, and verbal growth, S.R. Sheridan

Visual growth - The child is starting to use his eyes to tell his hands and brain exactly what to do. Sam's strange perpendicular drawing at age three combining a drawn head and torso with joined, perpendicular stick legs on page 106, suggests strong intention. Sam grew up to be an artist and a writer. Instead of the directives coming from within the brain, springing from neural structures and processes, the child starts to work in earnest on brain structure and process by using marks on the page - outside it's brain - to organize, change, or transform meaning. This external representation of meaning, of course, re-enters the brain via the eyes, in turn influencing how the brain thinks, in Sam's case, about portraits of humans, including the self-portrait. Note the huge difference between the drawing of a figure in the perpendicular drawing on page 106, at age three, and the drawing of "Other People" at age four on this page. Left to your own conclusions, would you have assumed that the drawing at age three was actually a drawing done at age four or five or six? Never jump to conclusions about children's drawings or other marks of meaning. Date them, observe them, contemplate them, support them, marvel at them!

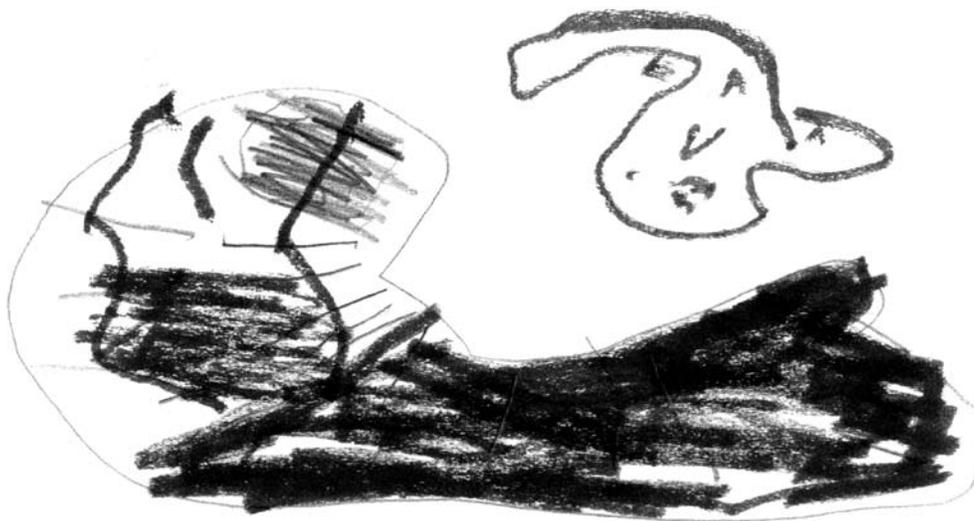
The move from scribbling to drawing in the context of more elaborate speech signals a transformation. So does the move from drawing to squiggly "writing lines," and to invented spelling. When children no longer see cursive handwriting or are taught it, I wonder whether they will produce squiggly "pretend-writing" lines. If they do, you can bet that squiggly "pretend-writing" lines have neural importance for speech and literacy.

Emotional growth - The child is starting to make use of the good feelings around sustained visual attention and mark-making to achieve increasingly complicated, inventive combinations of marks. These inventions can be talked about in new ways. New verbal and visual creations sound good, look good and feel good, providing a visuo/emotional neurochemical boost to story-telling. The combinations may even look like people, animals, houses, suns or a million other things to the child, including ideas. The handful of images on page 109 and 110 that follow were drawn by my son, Sam, at age three and titled by him.



Sam, "Other People", age 4. Unusual curved body.

Verbal growth - the child's interest in talking is encouraged by his marks. The scribbling and early drawing marks give the child more to talk about, while the extra processing energy¹ generated by drawing helps the brain to store words and to retrieve words linked to visual cues. Marks are grist for the mill of spoken language. The child begins to add letters and numbers to their pictures. Invented spelling begins. Mathematical thinking began long ago,^{36,37} as did musical thinking, given half a chance³⁸ but all these kinds of thinking can now proceed in a literate manner, using the appropriate symbols: numbers, letters used algebraically, musical notes, and so forth. The closing exercises in this Scribbling/Drawing/Writing program will show caregivers how to introduce some algebraic notation and musical notation, too, not just the letters of the alphabet and the numbers from one to ten or a few Euclidean nursery block shapes.



Sam's "Rattlesnake," and "Rock Shaped like a Whale," age 3.5

¹Sheridan, Susan R., 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

³⁶Lakoff, George and Rafael E. Nunez, 2000. *Where Mathematics Comes From*. New York: Basic Books

³⁷Worthington, Maulfry and Carruthers, E. 2003. *Children's Mathematics: making marks, making meaning*. London: Paul Chapman Publishing.

³⁸Rinehart, Carroll. 2007. "Creating OPERA in schools: Music as a Model for Interpreted Learning." *Journal of Music Education* pp. 224-227.



What caregivers can do to help !

Protect the child by letting him tell the story. Ask interested questions. Continue to label the child's drawings using the child's exact words. Always ask the child if it is all right to do this and where you can write the words. (How would you like someone to write words on your drawings without asking permission?) As I look back over my son's drawings at age three, I can not believe the labels: "The Planet is Named Micronaut," "Macer and the Figure that is Poisonous," "The Big Bird is Called the Micknrow, not Male," "Sam's Biggest Raw Diver." (I wonder what his smallest one might have looked like! And what's a "raw diver"?)



Sam's "Creatures from the Planet Ooz," age 3.5.

Sam titled this drawing, "Macer and the Figure that is Poisonous," age 3.5.



Sam titled this drawing, "Sam's Biggest Raw Diver", age 3.5.



Sam titled this drawing, "The Big Bird is Called Micknrow, not Male," age 3.5.





24-36 Months, or 2-3 years
Mature Scribbling

Name: _____ Date: _____

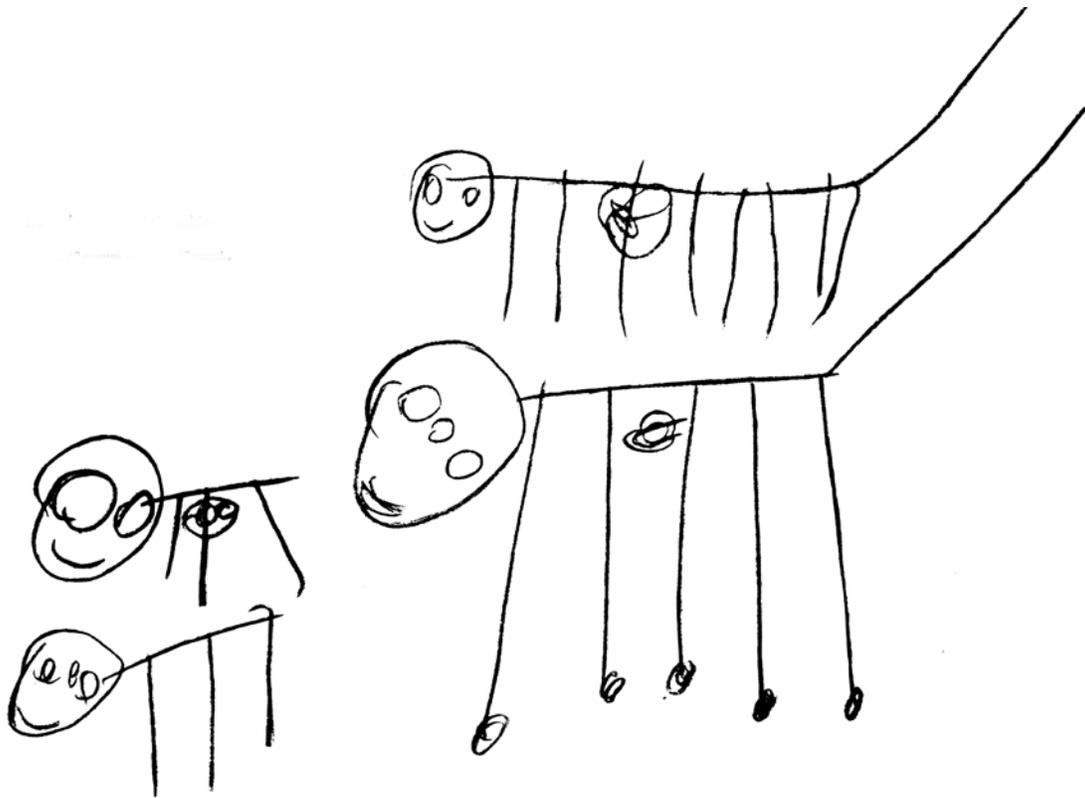
Child says about this drawing: _____

insert photo
of your child

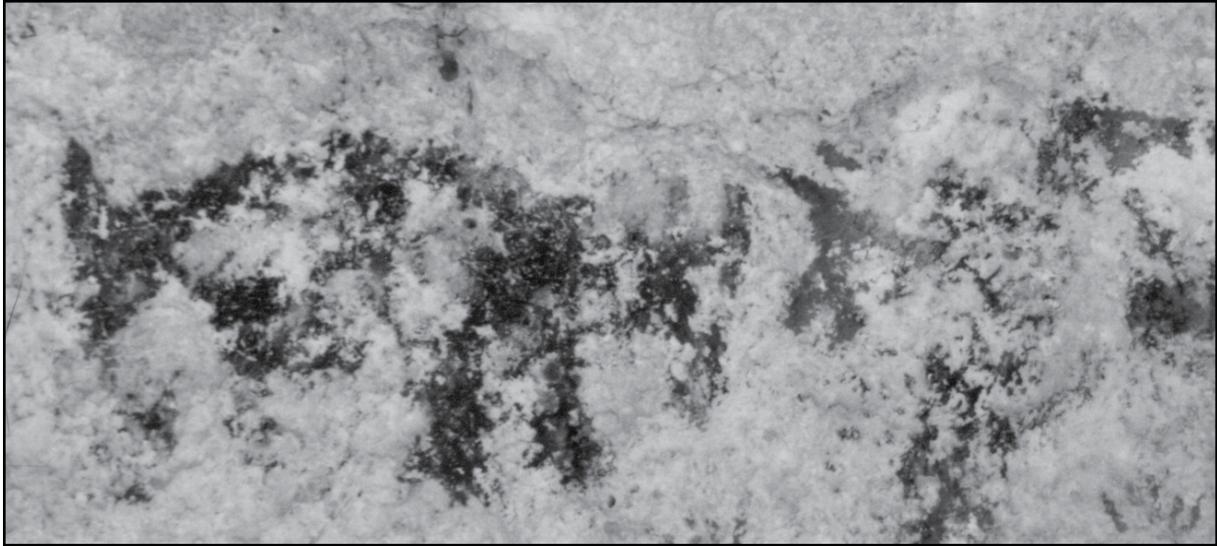
Developmental Stages

Saving Literacy

Examples of drawings will be taken from Sylvia Fein's longitudinal study of her niece's horse drawings.



*Heidi, Sylvia Fein's niece, was 4 years, 3 months old when she did these earliest horse drawings. From **Heidi's Horse** by Sylvia Fein, by permission from the author.*



Rose Tree Ranch, animal, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100- A.D. 1450.

Beside the drawings of suns, baskets and nets in the Shoshone caves, we find a more figurative drawing of animals. The artist, like Heidi, knows that these animals have a head, a back, a tail, two ears or horns, and four legs. It might be two bison, facing off. Or two male antelope. Or two wolves. Or two horses. The tails are short and held high.

The petroglyph of a lizard shown below has been created, not as a line drawing, but as a picked-out volume, white against the darker walls of the cave. The art in this Shoshone cave occurred over time, created by more than one artist, but the period remains approximately 1200 b.c.e., the time of radial sun drawings and spirals and bisected and quadisected circles around the world, as such shapes continue to occur at the beginning of the HIGH/MATURE stage of scribbling as it transitions into early drawing in young children all over the world.



Rose Tree Ranch, lizard, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100- A.D. 1450.

Saving Literacy



Author, cave

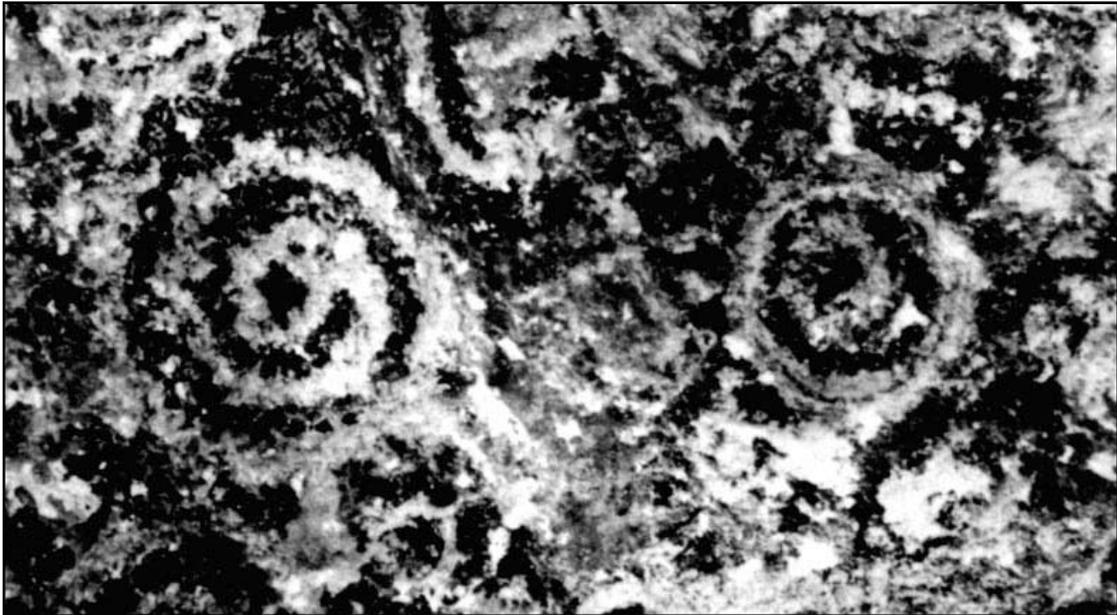


Rose Tree Ranch, perpendicular figure, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100 - A.D. 1450.

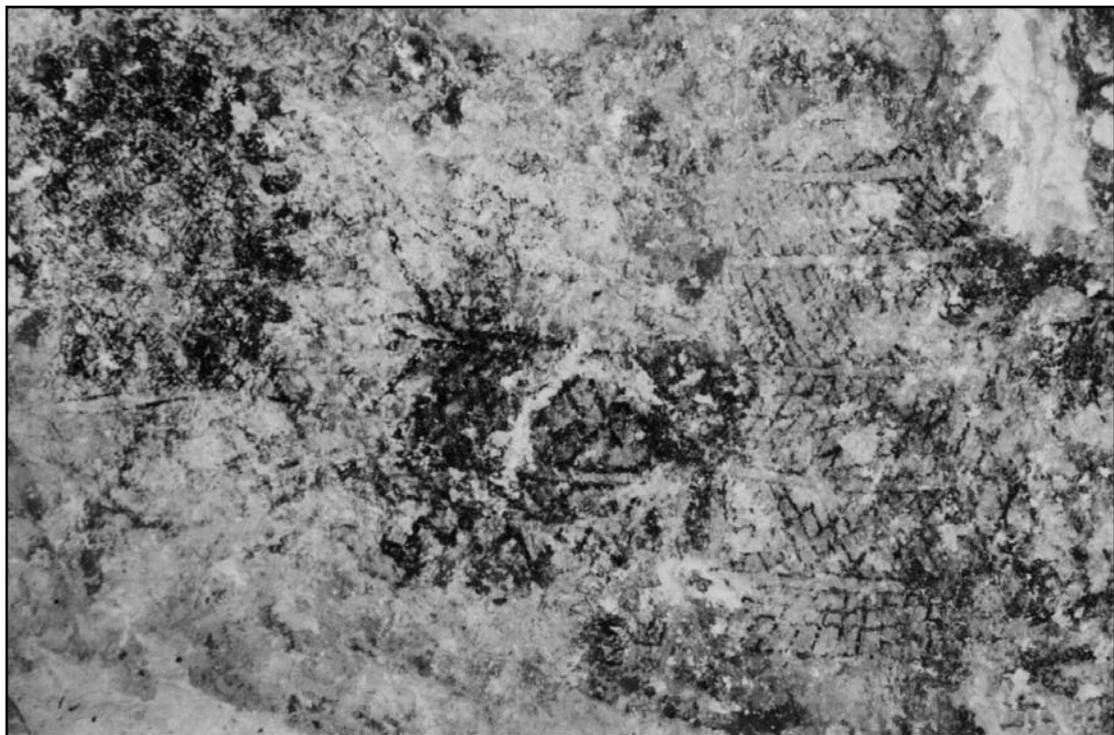


Rose Tree Ranch, perpendicular, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100 - A.D. 1450.

In the Shoshone Indian caves, 1200 b.c.e, the spiral is clearly depicted, but so are embedded circles. We see images which remind us of children's special scribbles and drawings.



Rose Tree Ranch spirals, in the Shoshone Indian caves, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100 - A.D. 1450.



Baskets, Nets & Sun Rose Tree Ranch in the Shoshone Indian caves, petroglyph images, Hohokam Classic Period, American SouthWest, A.D. 1100 - A.D. 1450.



What to look for, nurture and protect

Developmental milestones, end of the fourth year, Loyola University Medical Center

Movement milestones - hops and stands on one foot, goes upstairs and downstairs without support, kicks a ball forward, throws a ball overhand, catches bounded ball most of the time, moves forward and backward with agility.

Hand and finger milestones - copies square shapes, draws a person with two to four body parts, uses scissors, draws circles and squares, begins to copy some capital letters.

Language milestones - understands the concepts of “same” and “different,” speaks in sentences of 5 or 6 words, speaks clearly enough for strangers to understand, tells stories.

Cognitive milestones - correctly names some colors, understands the concept of counting and knows a few numbers, approaches problems from a single point of view, begins to have a clearer sense of time, follows three-part commands, recalls part of a story, understands the concept of same/different, engages in fantasy play.

Social milestones - interested in new experiences, cooperates with other children, plays “mom” or “dad,” dresses and undresses, negotiates solutions to conflicts.

Emotional milestones - imagines that many unfamiliar images may be “monsters,” views self as a whole person involving body, mind and feelings, often cannot distinguish between fantasy and reality.

Note: By the end of the fourth year, Loyola University’s “developmental health watch” includes the following areas for concern: the child cannot grasp a crayon between finger and thumb... has difficulty scribbling, shows no interest in interactive games... doesn't engage in fantasy play, lashes out without any self control when angry or upset, cannot copy a circle, doesn't use “me” or “you” appropriately.

This list strongly suggests that the motor control in scribbling and drawing, along with emotional control and a sense of self are interconnected neural events. This interconnection supports the theory and practice in this book: marks and the human mind develop together. They're an interactive unity.

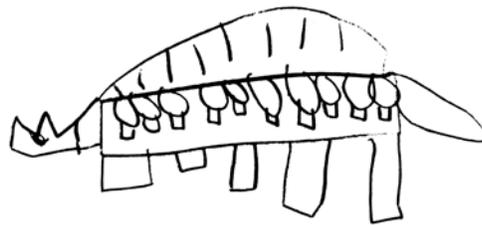
EARLY DRAWING

From approximately 3 to 5 years of age, the child is intent on making the drawing look like something both inside her head and outside her head, that is, both as a conceptual drawing and as a representational drawing. Typically the child draws the “tadpole” human, or a “Mr. Potato Head” body/face with stick arms and legs. The child knows a human has a head, two arms, two legs, two eyes, a mouth. The face is dominant and may double for the body. For the child, especially the female child, the human face holds many visual cues about people's moods.

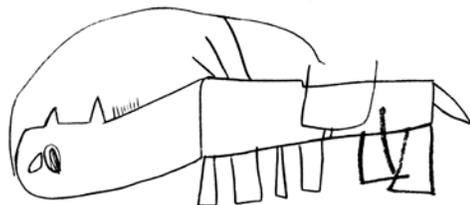
We'll use Sylvia Fein's careful records of her niece, Heidi's, horse drawings from age four through six to illustrate the three stages of drawing: Early, Middle, and High, or Mature. Clearly, in these early drawings, Heidi is showing she knows a horse has a head, a back, a tail, and four legs. Through direct experience, she also has observed that a horse may wear a saddle. She has ridden on a saddle.

Five months of drawing horses this way is enough. Heidi is satiated and seeks change. She discovers that something occurs when she closes the gap between leg lines: the leg attains breadth as well as length. She then draws the body in the same way and the horse achieves a new dimension.

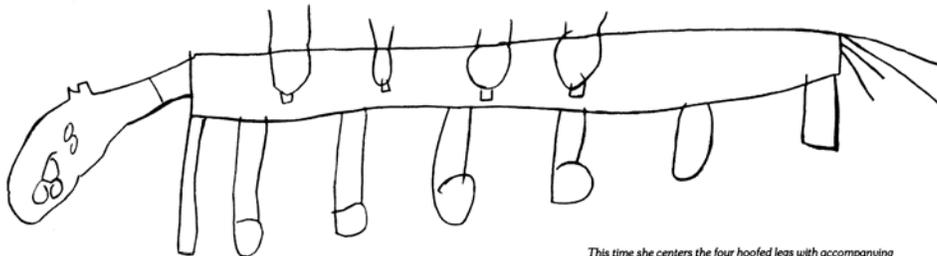
4 years / 9 months



The number of legs is still determined by the length of the body and Heidi finds it necessary to draw five legs (with ten saddles!) for this horse, but with the next two drawings she attempts to plan four legs per horse.



After drawing the head and body she places four legs close to the front of the horse, leaving a long space behind. She sees this imbalance and provides two more legs in a different color.



This time she centers the four hoofed legs with accompanying saddles above, but the spaces remaining on both sides of these legs still disturb the relationship between body and legs, and Heidi must again add legs. They are compromises: she treats them indifferently by omitting their hoofs.

Developmental Stages

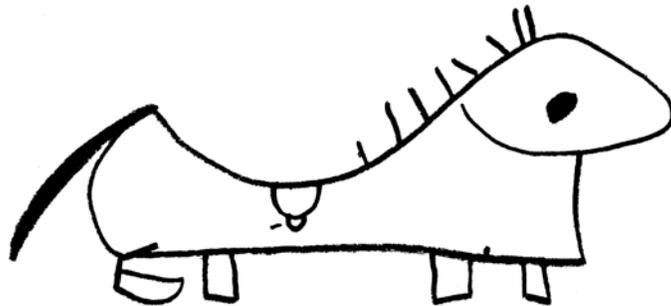
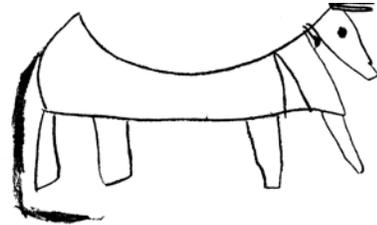
Heidi, at four years, nine months, produced horse drawings like these, From Heidi's Horse by Sylvia Fein, by permission from the author.

Saving Literacy

*Heidi's horse drawings at four years, 10 months, From **Heidi's Horse** by Sylvia Fein, by permission from the author.*

Until now the connection between body and legs has been limited to the simplest interaction of line, the perpendicular. This changes as Heidi moves to new considerations. The first variation appears as she changes the previous straight line of the horse's back (with which she has had close and sometimes painful contact) into a long shallow curve. She concentrates on creating this curve.

4 years / 10 months



How the Stage of Early Drawing relates to visual, emotional, and verbal growth, S. R. Sheridan

Visual growth - the child is using her eyes and visual cortex to see lines, and shapes, colors, and motion and to think about what lines and shapes and colors and motion can do and mean. Moving objects are alive, while non-moving objects may or may not be alive. Objects dropped will fall directly down. The natural world is full of subtle differences in color from the palest pinks of roses to the dark greeny blue of the ocean on a stormy day, to the black-green of a still, early-morning pond surrounded by fir trees.

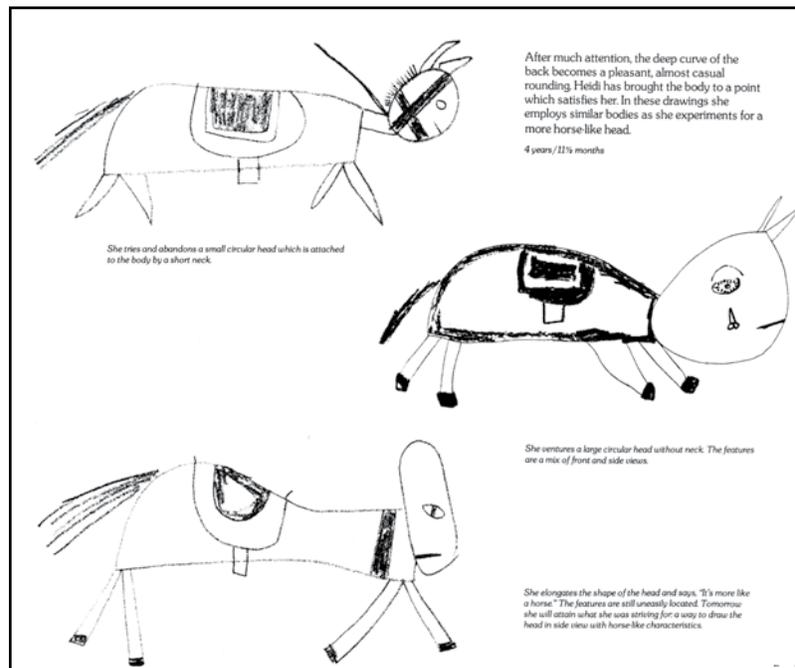
Mentally, children are starting to move toward, attach to and communicate with things, creatures, people and places in the world and also with ideas inside the head. The child can still access the universal neural shapes of thought but these shapes are being overlaid and decorated with observational and emotional and intellectual complications. **Protect the child from canned images or clip art (rainbows, hearts, flowers) which may prevent (limit) the child from inventing and imagining her own repertoire of mental objects to move around with, attach to and communicate with in the external world as well as within the internal world of her own imagination.**

Emotional growth - the child is increasingly invested in drawing. This means that the child connects with her drawings, feels proud of the drawings and uses them to communicate with herself and others. By the same token, the child is vulnerable vis a vis her drawings. One word of criticism at this age can turn the child away from drawing for a lifetime. Ask adults around you and see if this is not the sad truth with a good percentage of them. The child's

successful connection with communication needs to be protected so that the child does not learn to “hate” his drawings because no one can understand them or because everyone or anyone keeps trying to fix them. Being misunderstood or found deficient in drawing may force the child to withdraw from the rest of mark-making - including writing words and numbers, even from speech - as a shaky, scary enterprise. Being invested in reading and writing depends, in part, on how a child feels about his scribbles and drawings. If you want your child to grow up confident as a literate human being, support your child’s drawings. This does not mean that you need to coo mindlessly over every single one of them. But, by this age, find areas to praise and praise them, specifically: “This line is especially accurate for this part of a car, don’t you think?” Then ask the child to explain why. Help with additional vocabulary if useful. “Oh, you mean this part, the hubcap?”

Verbal growth - the child who talks about his drawings is connecting speech with literacy. Talking, reading, writing are part of the child’s need to connect and communicate. Talking, reading and writing are survival strategies. As the child develops confidence in the ability to express meaning, she will talk more, draw and write more. What a super-pseudopodial repertoire for an organism with a brain destined for symbolic thought where all its symbols spring from the earliest outreach of the touch of a scribble!

Being invested in reading and writing depends, in part, on how a child feels about her scribbles and drawings.



Developmental Stages

Heidi's horse drawings at four years, 11 months, from Heidi's Horse by Sylvia Fein, by permission from the author.



36-48 months, or 3-4 Years
Early Drawing

Name: _____ Date: _____

Child says about this drawing: _____

insert photo
of your child

Today, within an hour, the new rusea horse springs from yesterday's discordant attempts. No longer formed of separate body, legs, neck and head, he is at last one unified shape against the clear ground, enclosed in his oscillating horse-shaped outline. Heidi now works to learn and conquer the complexities of this new horse.

5 years / 2 weeks

She includes head, neck and body in a single line; the legs are added.

Ears, head, neck, body and the aft front leg are unified.

The angular shape of the head is sacrificed temporarily in order to get around the rest of the horse with a continuous line. Her preoccupation with this goal results in providing only one front leg and one hind leg, each of which she then divides with a line into two, a bit of practical salvage.

She places a separate unit composed of ears, head and neck against a unit composed of body and four legs.

This time she draws separate hind legs, but must divide the single front leg into two.

She partly unifies head, neck, body and includes the advancing front leg in a single line.

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Heidi's horse drawings at age five years, two weeks, from *Heidi's Horse* by Sylvia Fein, by permission from the author.



What to look for, nurture and protect

Developmental milestones for five years of age (taken from *Caring for your Baby and Young Child, Birth through Five Years of Age*, editor in chief, Steven P. Shelov, The American Academy of Pediatrics, 1991, 1993, 1998).

Movement milestones - stands on one foot for ten seconds or longer, hops somersaults, swings, climbs, may be able to skip.

Finger and hand skills - copies triangle and other geometric patterns, draws person with body, prints some letters, dresses and undresses without assistance, uses fork, spoon, and (sometimes) a table knife, usually cares for own toilet needs.

Language milestones - recalls part of a story, speaks sentences of more than five words, uses future tense, tells longer stories, says name and address.

Cognitive milestones - Can count ten or more objects, correctly names at least four colors, better understands the concept of time, knows about things used every day in the home (money, food, appliances).

Social milestones - wants to please friends, wants to be like her friends, more likely to agree to rules, likes to sing, dance and act, shows more independence and may visit a next-door neighbor by herself.

Emotional milestones - aware of sexuality, able to distinguish fantasy from reality, sometimes demanding, sometimes eagerly cooperative.

MIDDLE DRAWING

What a progression from age four to age five! In Heidi's drawing on the opposite page, the horse has a bushy tail, a mane, a mouth with teeth, a detailed saddle with a pommel, reins, a bridle, a rider with a riding hat.

From the age of four to five years old, the child is intent on making the drawing look even more like something outside her head, experienced in the physical world. Still, the drawings are a mix of qualia and quidditas, or what I call Q/Q drawings which combine universal qualities or forms, with the specificity of idiosyncratic detail in the world.

"**Qualia**" is a word used to describe certain characteristics of conscious experience. It comes from the Latin adjective, "quale, qualis," meaning "of what sort", "of what kind". Qualia is the plural form. As an indefinite noun, it means "having some quality or other" (Cassell's Latin-English Dictionary, Funk and Wagnalls, NY, 1959). People who write about conscious mental experience use qualia to describe awareness of the essential, categorical properties of a thing. For instance, qualia is the same as Platonic "whatness," or the eternal, abstract qualities that exist above and beyond the material world. If we consider a chair in its simplest, most irreducible nature, it is an item which can support us when we are sitting. It could have a back, and four legs, but it might not. It might be a bean bag. Whatever general characteristics are absolutely necessary to chair-ness are its qualia: for instance, sit-on-able-ness.

You'll notice that your child's drawing will capture the most important aspect of the thing - its whatness, or qualia in the child's mind. In Heidi's case, the qualia of a horse are a long back, a head with eyes, mouth and ears, four long legs, and a tail.

On the other hand, what I call "**quidditas**," another Latin word for "whatness," but the whatness of certain, specific qualities, as in "this certain or specific tree" (with yellow leaves that are long and narrow) rather than as a general quality of trees as "branching structures." Quidditas is the flip side of the consciousness coin. As I have coined the term to describe the information that makes a painting of a stark house in Maine so "real" because of minutely observed details, **quidditas** compliments and complements **qualia**. Think of a painting of fruit by Cezanne. He insisted that the qualia of formal universal shapes must be drawn, felt, sensed under whatever local details and color emerged and were overlaid as the painting progressed. Quidditas is an Aristotelian rather than a Platonic term, a quality in drawing, painting or writing which springs from a keen awareness in the thinker of the individual, idiosyncratic qualities of a chair; say, its oldness or yellowness, its broken back or rung. In Heidi's case, she has noted that a saddle may or may not be part of a drawing of a horse. A saddle is **quidditas**.

The ability to focus on and extract essential information from the environment is a critical survival skill for any creature. Drawing qualia and quidditas strengthen this ability.

How the Stage of Middle Drawing relates to visual, emotional, and verbal growth, S.R. Sheridan

Visual growth - the child begins what Douglas Hofstadter (author of *Gödel, Escher, Bach: The Eternal Golden Braid*, 1979, a seminal book on the interconnections between art, music, computer programming and brain function) calls analogical thinking. Analogical thinking is based on a formal construction: As A is to B, so C is to D. Analogies demonstrate functional similarities. For instance, a can opener could be said to be analogous to a key because both are used to open things. A closer analogy might be the relationship between a can opener and a blow torch because each makes openings by cutting through metal. An analogy is a strategy for mapping one item onto another, often physical items in the "real" world, by seeing similarities. An analogy is a special kind of simile or metaphor. A simile uses the words "like" or "as," and a metaphor makes a direct comparison between

Saving Literacy

Examples of Drawings

The circular formation and vertical-horizontal lines permit formation of the first horse.



Refinement: the horse receives four legs - - only four.



First deviations from the vertical-horizontal are used for ears and legs in opposing diagonal directions. The new diagonals immediately unify head and neck and create a new shape.



The unification of the head and neck is applied to contain the whole horse within one unbroken outline.



Problems of leg-spacing and length are solved.



The new diagonal directions of line allow the horse to run.



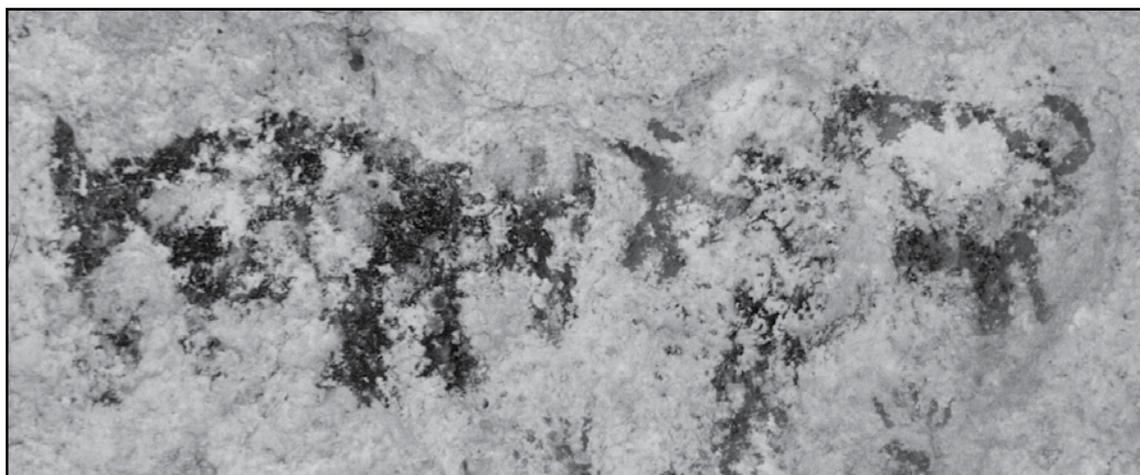
A learning plateau provides time to consolidate, and to enrich the horse's gear and markings.



Heidi's last major construction before her sixth birthday is to extend the horse's head toward the ground, "so he can eat."



Heidi's Horse by Sylvia Fein, by permission from the author.



Petroglyph, Rose Tree Ranch, Elgin, Arizona, animals and handprints.

two items. For instance, “a can opener is a blow torch” is a metaphor; “a can opener is like a blow torch” is a simile; and “As the serrated blade turned by gears is to the can opener, so the stream of ignited gas is to the blow torch” is an analogy.

My son, Sam, invented two metaphors at age three based on physical similarities: “rainbow noodles” for macaroni and “zebra trees” for birch trees. He mapped noodles onto trees, using black and white stripes. Around the age of three or four or five, children become metaphorical. Finding sameness and difference is natural to children and it is critical to mental development. As Douglas Hofstadter has observed, the ability to see sameness and difference is the major challenge and skill of mental life.

At this Middle Drawing Stage, the child is able to create and store mental images: it draws a horse and stores the drawing (in his brain) as the visual memory of a horse. The child can retrieve that visual memory and use it to represent a convincing horse on a piece of paper, without looking at a horse. They have the horse memorized.

Emotional growth - the child is starting to get excited and feel very good about her drawings. At age four or five, your child may not need her drawing to look just like the thing drawn. This need develops later and may be pronounced by age six. It is after age six that the five formal Drawing/Writing exercises in this book can be especially useful, helping the child to learn the few tricks of drawing that will allow the drawing to look very much like the thing drawn from the child's point of view.

The child’s motivation and ambition about drawing are precious. The secure, positive emotional tone developing around drawings will support a lifetime as a literate thinker, whether that thinker uses art or writing or mathematics or music to think and to be.

Verbal growth - the emotional confidence spills over into language-use. The child is excited about talking and feels increasingly secure about coming up with the right word and saying it. A child’s vocabulary continues to expand exponentially.



What caregivers can do to help !

You can explain the general vocabulary of art!

When children draw what they know to exist, even if they can not actually see it (like the invisible legs of a man sitting in a boat), this is called conceptual drawing. Cave artists drew realistically and they also drew conceptually. They drew what they could see and they drew what they knew existed even if they could not see it. For instance, even though the cave artist could not see two horns on an antelope in strict profile, he/she knew the antelope had two horns, so he/she drew them. Children start as conceptual artists. They draw what they know.

When children try to draw something so that it looks real, the drawing is called figurative, or representational, or realistic. Because the word “figurative” in the English classroom means metaphorical, or not real, in the sense of not being the thing, but standing for the thing, this gets confusing. When Sam called birch trees “zebra trees,” he made a metaphor. He used language figuratively. However, if he drew a zebra with stripes, he would be using images figuratively, or realistically. Visual literacy uses the term figurative one way (literal), while verbal literacy uses the term “figurative” another way (that is, to mean “metaphorical”).

When children deliberately distort lines, colors or other elements, their drawings can be called expressionist. It is important to be careful here. A child may be drawing realistically from her point of view, combining how the thing looks and feels in one unified statement, aligning her emotional and visual system.

Be careful about saying something insensitive like, “That elephant’s trunk is way out of proportion.” Or, “Wolves are not really red, you know.” Say you’d thought long and hard about a color to go with a scary animal like a wolf. How would you feel if someone said that wolves weren’t red when you had just drawn a red one?

When a child combines multiple views in one drawing, the drawing can be called cubist. But, again, be careful. The child may be drawing how the object looks and feels and means to him as an holistic experience. You could mention that you see a front view, a side view, and a top view. But, better to resist!

You’ll get the truth about the drawing straight from the artist. This “truth” will most probably astonish you with its complexity. By resisting analyzing the drawing for the child, you allow the child to grow his brain on his own terms. You keep out of the way.

When the child works with line and color without any attempt to draw a thing or paint a thing, the work can be called abstract expressionist, or non-figurative work or non-objective or non-representational art, or, again, conceptual art. This kind of work may be a picture of an idea, the form of a feeling or something else altogether. Ask the child.




MATURE/HIGH DRAWING: 60-72 Months, or 5-6 Years or Older. Representational and Abstract Drawing and the Metaphorical Child. Getting Ready for Reading and Writing Words.

What to look for, nurture and protect

The following information was combined from two sources: <http://www.pbs.org/parents/childdevelopmenttracker/six>, and from <http://www.greatschools.net/parenting/social-skills/developmental-Milestones-your-six-year-old-child> written by Joyce Destefanis, M.A., and Nancy Firchow, M.L.S.

Note: By this time, parents' attitudes toward the child's ability to think, do, learn and know, as well as toward competition and achievement and winning and losing will have strongly influenced the child's theory of learning and knowledge, including her abilities to handle and grow through achievement and failure. As Josh Waitzkin, chess prodigy, writes in his book *The Art of Learning: An Inner Journey of Optimal Performance* (2007), "It is clear that parents and teachers have an enormous responsibility in forming theories of intelligence in their students and children - and it is never too late. It is critical to realize that we can always evolve in our approaches to learning. Studies have shown that in just minutes, kids can be conditioned into having a healthy learning theory... The key to pursuing excellence is to embrace an organic, long-term learning process" (pps. 32-33). The goal of *HandMade Marks* and its Scribbling/Drawing/Writing process is to help parents and children see learning as a lifelong, long-term experience, with ups and downs along the way. A child who can grow through frustration and failure, while triumphing in moments of highest achievement, has a healthy, organic approach to her intelligence and ability to learn and achieve.

Movement milestones - Six-year-olds continue to enjoy moving in a variety of ways. Although far from proficient in motor skills, this does little to dampen their enthusiasm for trying out new activities and sports. They are able to run in various pathways and directions and can manipulate their bodies by jumping and landing, rolling and transferring their weight from feet to hands to feet. Their hand-and foot-eye coordination is still developing, so skills like throwing, catching, kicking and striking are still emerging. With the right equipment, however, and a skillful partner, their motor skills continue to improve. Note: During this period of development, children's actual skill levels will vary based on their amount of physical activity. Sedentary children will not mature as quickly as those who participate in activities like dance lessons, team sports or backyard play.

- may still be somewhat uncoordinated and gawky
- able to learn to ride a bicycle
- can move in time with music or a beat

Note from the author of this book. The following milestones for language, cognition, and social and emotional development require dedicated input by caregivers: parents, mentors, teachers. A child does not acquire a “sophisticated” use of language nor become a “true reader” without the sustained support of on-going conversations with others as well as the frequent experience of being read to and practice with reading.

Language milestones - The language skills of six-year-olds become increasingly sophisticated throughout the year. Their vocabularies rapidly increase and their language moves beyond communication to provide a foundation for learning, including the development of independent reading skills. In general, their pronunciation of words is clear and they use complex grammatical forms accurately.

Cognitive milestones - Six-year-olds have longer attention spans and continue to prefer structured activities to more open-ended experiences. They enjoy taking on new roles and responsibilities, but still require much direction from adults and frequently ask questions to ensure that they are completing tasks the right way.

- In first grade, children transform into true readers. They apply their knowledge of how print works and practice strategies to decode unfamiliar words. They learn to read aloud with fluency, accuracy and understanding. They read a variety of texts for pleasure (e.g., stories, informational texts, poems) and draw upon a variety of comprehension strategies to understand and enjoy texts. Children this age write stories, notes and descriptions. Most are able to develop an idea beyond a sentence and will add some details to help describe or explain things in their world. They enjoy sharing their writing with others.
- In mathematics, six-year-olds can typically count up to “200” and count backwards from “20.” They understand the concept of “odd” and “even” numbers and can represent numbers on a number line or with written words. They use increasingly more sophisticated strategies to solve addition and subtraction problems. They also count the sides of shapes to identify them and can combine shapes to create a new one. Six-year-olds can also give and follow directions for moving around a room or on a map.
- Scientific discovery for children this age is affected by their tendency to straddle the world between make-believe and reality. Six-year-olds might continue to give animals human characteristics, such as suggesting what a worm might be thinking or that a butterfly has eye

lashes. Gentle encouragement to look closely at worms and butterflies will help children to describe more objectively what they observe. Science experiences for this age group should continue to immerse children in first-hand investigation of the world around them, so they can continue to build a reservoir of experiences from which they can begin to draw as their thinking becomes more sophisticated.

A child's development in the creative arts varies greatly based on the child's experiences with art, music, dance and theater. Given exposure and practice, six-year-olds use a wider variety of materials to create visual images that combine colors, forms and lines. They can also remember the words and melodies to a number of songs and may sing or play these songs on instruments. They can also be taught how to read music and write simple music notation. With dance, six-year-olds can create, imitate and explore movement in response to a musical beat. The dramatic play of six-year-olds show greater creativity and complexity in the use of props, costumes, movements and sounds. Children this age can also repeat simple text and cooperate with others in a dramatization.

- moving toward abstract thinking
- develops reasoning skills
- shifts from learning through observation and experience to learning via language and logic
- wants it all; has difficulty making choices

Social milestones and emotional milestones - In terms of social and emotional development, six-year-olds are confident and delight in showing off their talents. They start to display an increasing awareness of their own and others' emotions and begin to develop better techniques for self-control. Six-year-olds enjoy sharing toys and snacks with friends, although conflicts among peers may remain quite frequent. Predictable routines are important sources of stability and security for children this age. Six-year-olds also draw emotional stability from their interactions with adults with whom they feel secure, particularly during challenging situations and circumstances.

- grows more independent, yet feels less secure
- craves affection from parents and teachers
- friendships are unstable; can be unkind to peers
- needs to win and may change rules to suit herself
- may be hurt by criticism, blame, or punishment
- can be rigid, demanding and unable to adapt
- increasingly aware that others may have different feelings

MATURE/HIGH DRAWING: Figurative/Abstract Drawing and the Metaphorical Child

Verbally, this stage begins at about three; visually it can happen from about the age of three, also, but may not be evident until later. While attempting to represent the external world faithfully, the child is also intent on mapping that external world, via marks, back onto his own earlier attempts at drawing, as well as onto hard-wired, pre-existing internal shapes of thought. The child is already reaching for new ways to say things, using images and words while refining drawing skills and working on phonics and writing skills. His drawings may be “surreal,” like Magritte (hyper-real in terms of accuracy, but weird in terms of juxtapositions) and his written expressions may include visual and verbal metaphors, similes, hypotheses, analogies, predictions, and speculations. The lesson plans will lead you through these categories, both visually and verbally.

How the Stage of Mature/High Drawing relates to visual, emotional, and verbal growth

Visual growth - the child returns to drawing what it knows to be true (conceptual drawing) as well as what it sees to be true. Realism and Abstraction are two satisfactory options for the child at this point.

Emotional growth - a drawing that combines what the child knows to be true with how a thing looks and feels is going to please the child mightily as an item that exists at the level of Truth or Beauty. The child will know it has produced something special --- what I would call an integrated Qualia/Quidditas (Essential, Enduring, Necessary, Categorical Idea of a thing plus the Individual, Specific, Incidental Aspects of a thing) drawing. Such a drawing combines multi-sensory information about an item with what the brain knows to be especially true about the item. Until you look through art history books or achieve a Q/Q drawing yourself, you may not know what I mean. Your child will, however, create such Q/Q drawings without any instructions.

Verbal growth - The child wants to produce more than the simple, declarative sentence, “This is a rock.” Like Sam’s comment about his drawing, “This is a rock shaped like a whale,” the child invents simile and metaphor as a new combinatorial way to describe what it knows in ways that leap beyond straightforward naming and description. Through simile and metaphor, the child is expressing thought, using a combined Qualia/Quidditas construction, revealing not just incidental feel/look/smell/taste/sound of a specific item, but, in addition, some fundamental, shared category like stripedness (remember Sam’s term “zebra trees” used to describe birch trees? Both zebras and birch trees have black and white stripes).

 <p>STAGES</p>		<p><i>60-72 Months, or 5-6 Years and Beyond</i> SECOND TRANSITIONAL/TRANSFORMATIONAL MARK-MAKING STAGE: Proto Mathematics/Music/ Writing</p>
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SECOND TRANSITIONAL/TRANSFORMATIONAL MARK-MAKING STAGE: Proto mathematics/music/writing. (See pages 127-129 for 5-6 year old milestones.)

From about age five, the child will make marks that look like writing: printed lists, cursive script, the alphabet, numbers, musical notes. Left to her own devices as a mark-maker, it is highly likely that the child would invent her own mathematics and musical notational systems, probably before invented spelling. That's one of the aims of this book: to see how children actually invent mark-making systems and to share these observations, creating a data base for research.

The child may draw less at this stage because of the reported tendency of the left hemisphere to suppress the right at this early stage of writing.³⁹ I myself have not observed the suppression of drawing for the sake of writing. Little boys draw more and more. Because little girls are so verbal and because society does not encourage their drawing skills as much, little girls may draw less. But this does not necessarily mean that at age five or six, the left hemisphere of the brain suppresses the right hemisphere. We need to see what happens when drawing skills are expected and encouraged in little girls as much as their speaking and writing skills. The data generated by this book may help us understand both boys' and girls' normal visual, spatial, verbal and emotional development more clearly.

How the Second Transitional/Transformational Stage of Mark-making relates to visual, emotional, and verbal growth, S.R. Sheridan

Visual growth - The child uses marks as pictures of things, pictures of sounds (including musical sounds and word sounds), and pictures of numbers and relationships.

Emotional growth - the child feels pleasure and pride as a thinker who can use pictures, words, numbers and notes; the child is on the way to being confident in terms of multiple literacies, equipped for a rich life of thinking about the world, and her place in it.

Verbal growth - the child is not limited to words "verbally." His languages range beyond words to numbers, equations, musical notes.

³⁹Adi-Japha E., Freeman NH. "Development of differentiation between writing and drawing systems." *Developmental Psychology* 2001 Jan;37(1):101-14



What a Caregiver Can Do to Help!

From the time your child has the interest, say at two to three years of age, and surely by age 4, share art books and illustrated science books with your children; take them to art and science museums. Ask your child what's going on in art and science images. Look through art and science books on your own and scout out museum collections to select images that you feel are appropriate for your child. What offends or worries or bothers you will probably do the same for your child, either because the child will feel your concern or because the images are actually disturbing to the child.

Still, a child may know just how "The Scream" by Edvard Munch feels. A discussion of fearfulness may prove useful to your child, helping you and your child to know your child and his fears, allowing you and your child to talk about identifying and managing emotions. My grandson, for instance, is terrified of loud sounds. "The Scream" might, one day, help him tell his mother why he is afraid of loud sounds. She speculates that Ben associates loud noises with the traumatic event of seeing and hearing a tree being cut down by a chain saw. We will never know for sure until Ben can tell us. He is also terrified of the sound of a vacuum cleaner --- a common fear in young children. Sound can assault the ears of a child. Think about this when you play music or turn on the TV. Decibels above a certain frequency create permanent hearing loss.



60-72 Months, or 5-6 Years and Beyond.
THIRD TRANSITIONAL/TRANSFORMATIONAL STAGE:
Drawing/Writing

THE THIRD TRANSITIONAL/TRANSFORMATIONAL STAGE:

Drawing/Writing. (See pages 127-129 for 5-6 year old milestones.)

The natural impulse of the child is to represent meaning in at least two ways, that is, by drawing and writing, moving back and forth between them for the sake of richer, deeper meaning. Illustrated stories are made for them!

How Drawing/Writing relates to visual, emotional, and verbal growth,

S.R. Sheridan

Your child is ready to become a balanced bilateral thinker, equally at ease with image, text, and image/text productions. Your child will have the visual-attentional capabilities to read books over hours or to decode electronic mixed media in seconds. Your child needs both skills and both speeds; to read images and text slowly for detailed content and to read images and text fast for overall meaning/message. Then the child needs to be able to make decisions about the usefulness or relevance of the details **and** the overall message.

Mark-making becomes a magic mirror in which children see themselves, know themselves and transform themselves. In so doing, children can learn to identify and work with strong emotions reflectively, not just reactively. The child has a chance to live a life in which emotions help him/her to seek and find, but not to harm nor destroy him/herself and others. The child has a chance to evolve visually, emotionally, and verbally. **Intelligent responses in biological organisms preserve freedom of movement, extend possibilities for nourishing attachment and receive life-sustaining information, while ridding itself of damaging information. The organism which relates symbiotically to its environment will not destroy it. It will achieve synergy. It will conserve energy. It will achieve restful, healing states across biological levels, including levels of consciousness.**

CONCLUSION

Let's review the list of developmental milestones from before birth to the age of five or six proposed by this book, noticing overlaps with standard milestones for birth through age five, while seeing how the traditional pediatric list differs from - or, on the other hand - aligns with our list that follows.

Notice the importance of motion to normal development in all of the traditional developmental milestones. Notice the importance of motion in the Neuroconstructivist list, too (Neuroconstructivism is Sheridan's term for brain-growth and is defined on pages 57-60). Notice how motion including scribbling relates to speech and make-believe on both lists. In fact, we get the distinct feeling from traditional pediatric milestones as well as from developmental stages established by child psychologists, as well as from our Neuroconstructive list below, that scribbling and drawing are important developmental milestones for young children.

The Neuroconstructive developmental milestones for the child, pre-natal through five years of age as organized by the author:

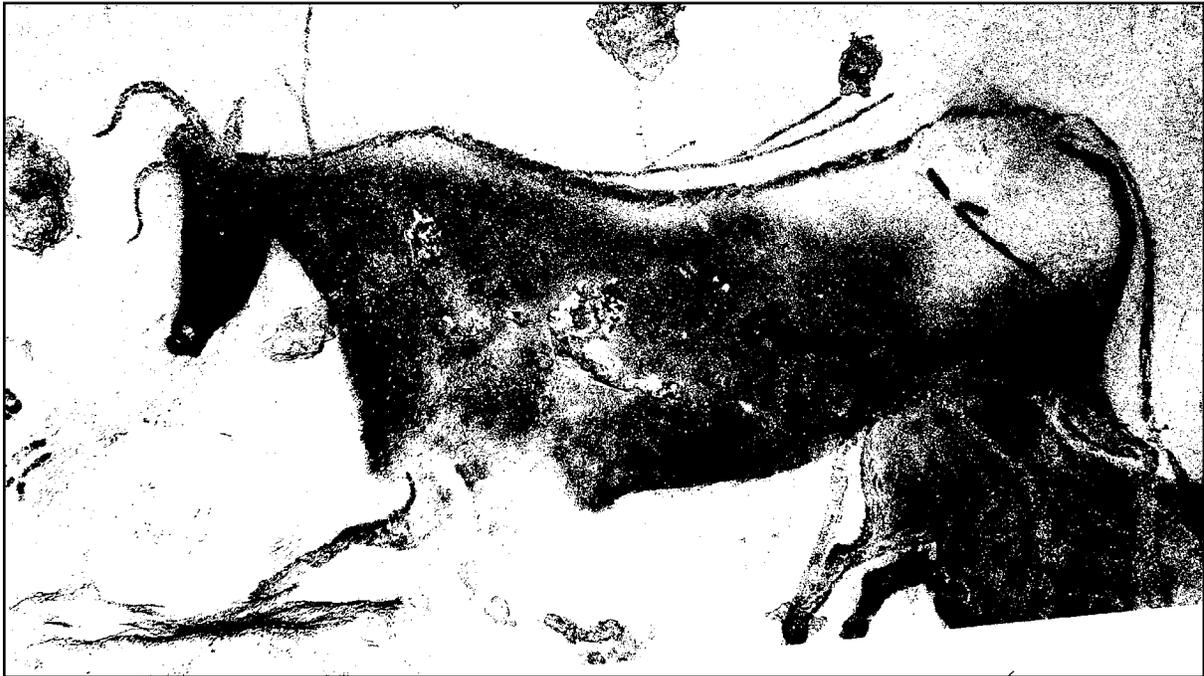
- Squirming and wriggling and kicking inside the womb
- Squirming and wriggling and kicking outside the womb
- Exhibiting the Moro reflex: grasping with fingers and toes. Startling to sudden sounds.
- Rooting and sucking.
- Looking; starting to use the eyes to know
- Reaching and grasping; starting to use the hands to know
- Using the hands to put things in the mouth: continuing to use the hands, eyes, and mouth to know
- Rolling over

Saving Literacy

- Belly laughter at about 2-3 months of age, probably on recognizing mother's face in the middle of the night, signaling a phenomenal combinatorial cognitive event, which rewards the brains of child and mother with pure joy. (This has been my experience as a mother with all three of my children. Only readers can confirm this as a universal early childhood event.)
- Sitting up
- Crawling
- Picking up minutiae and examining everything scrupulously with mouth, eyes, fingers
- Toddling
- Scribbling
- Walking, running
- Reading scribbles
- Talking
- Reading/talking about scribbles
- Drawing
- Reading/talking about drawing
- Reading pictures in books
- Producing proto-mathematical, musical, and text-based marks
- Reading one's own proto-mathematical, musical, and text-based marks (invented spelling)
- Inventing verbal simile and metaphor in everyday speech.
- Reading other people's words in books

At about 24 months of age, according to the milestones already provided by Loyola University Medical Center, the child "begins to do make-believe". This stage also correlates, according to Loyola's milestones, with the child's ability to produce "2 to 4 word sentences". It also correlates with scribbling. Make-believe is the ability to imagine what is not real and to enter into that unreality convincingly as if it were real. My grandson, Ben, at 24 months, looked at me, lifted a small straw basket, emptying out all the toys. Then, he paused, looked over at me and put the edge of the basket to his lips. I responded, "Oh, my, what a delicious drink!" Ben

smiled and, looking at me, again “emptied” the basket out. I said, “Oh, my, look at all those bananas that have fallen on the floor.” Ben smiled, looked at me and started grasping imaginary bananas and throwing them into the basket. I counted as he did so: “One, two, three bananas!” Ben laughed. And he did this make-believe routine over and over again. This kind of shared scenario shows that two year-olds who play make-believe clearly have a “theory of mind” or knowledge of what another person is thinking. Ben could scribble, play make-believe and had a theory of mind. Still, he was not talking yet. Should we worry? Well, we did a bit. But we trusted that Ben’s verbal development would play out as his mental development clearly had. We had ample evidence of his understanding of spoken language. All he needed to do was get his body and brain ready to speak. I urged scribbling. My daughter also engaged a speech therapist. It all worked out. Ben speaks!



"Bull", cave painting in Lascoux, France, reprinted from Encyclopedia Britannica on-line.

What a jump in the child’s mental life when her brain becomes vitally interested in “hen’s scratches” on a piece of paper as a way to look at her thoughts and think about them. This is where make-believe and spoken and written language and symbolic logic have their earliest beginnings. This is where one marks-based system requires another just as the cell nucleoli once needed a pseudopod, inventing a warping strategy to create an outreach system. "Pseudo" means "false" and "pod" means "foot." A pseudopod is a false foot extended by a cell to connect and move. That foot helps the cell to survive.

Little children play make-believe and little children start to string words together at about the same time. Make-believe and word-strings are a child's pseudopods: Combinatorial thinking must underlie both, just as some new way of combining dark lines made with charcoal, iron oxide, blood and fat on prehistoric cave walls in Spain and France drove the “artistic,” or visual/cortical

Saving Literacy

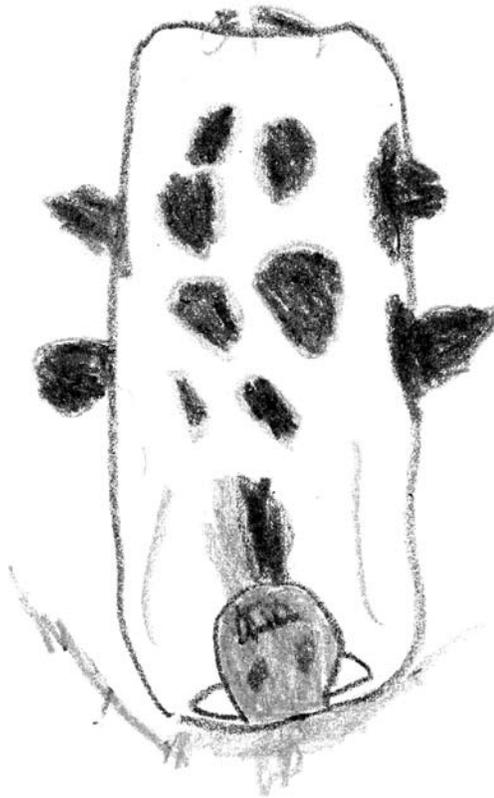
breakthrough called rendering (shading, chiaroscuro), representing visual experience in a whole new way (see the cave paintings above and on page 132). When the artist/shaman/drawer/writer works with a limited repertoire of materials, physical and symbolic (that is sticks, blood, fat; lines, shapes, shading), generating brand new images and symbols, the human brain is using “recursive,” “discretely infinite” thinking - the kind on which spoken (and written) language is built.⁴⁰ This is pretty impressive brain-work for a child or for an adult!

Let’s look at the drawing on this page by my son, Sam, at age three. Sam is representing his visual thinking in a new, combinatorial way, using two different kinds of mark-making systems, one embedded in the other. By the age of three, Sam’s brain had reached sufficient connectivity to jump to a new level of word-use (remember his metaphors “rainbow noodles” and “zebra trees”?). About the time that his visual cortex could draw, that is, at age 3, Sam was able to operate with images and words in new, combinatorial ways. Given serious spatial and material constraints (charcoal inside dark caves, crayons on newsprint), both the cave artist and the child-artist manage to express a wide range of meaning graphically. In fact, within such tightly constrained systems, anything is possible. This ability to express meaning using marks in many ways is a characteristic of written language, too. Anything is possible.

This ability to represent something big and complicated using a simple and small repertoire of lines and shapes and colors and words rests on the extraordinary power of recursive systems to use the discrete number of elements which comprise these systems over and over again, potentially infinitely. Recursion is responsible for tree growth, and child-growth. Marks morph into new shapes to express new meaning. The cell does the same thing; it changes shape when it needs to move.

Parallel systems: child-marks and child-speech

We’ve noted that Sam’s two metaphors invented at age three are evidence of a verbal break-through. Sam’s embedded drawing occurred at about that time, too. How do these two phenomena relate to the history of art? If the theories behind these exercises are correct, there is a relationship between stages of drawing and stages of speech. Drawing and speech are probably



Sam's drawing of "Person inside Something Else"

⁴⁰Hauser, Marc D., Chomsky, Noam and Fitch, W. Tecumseh. 2002. "The Faculty of Language: What is It, Who has It, and How did it Evolve?" *Science*, Nov. 22, 2002. Vol. 298, No. 5598. pps. 1569-1579.



*"The Chinese Horse",
Lascaux, France.
Reprinted by permission
of Yvonne Vertut,
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by Jean Vertut. All
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parallel systems, running along side-by-side like railroad brain tracks, with cross-ties securing information in one system to information in the other. These parallel brain tracks construct themselves via sections of neural cross ties.

It is historically true that Paleolithic artists drew contour drawings, including profile drawings before they invented chiaroscuro, or "light" (claro) and "dark" (oscuro) drawings which show an object shaded realistically. We have no Rosetta Stone to decode the double dashes near the muzzle of the horse in the Paleolithic wall painting known as "The Chinese Horse," and we have no tape recordings of Stone age speech.

But we can see that two different symbol systems exist, side-by-side, in this wall painting - the double dashes by the horse's head, the "tectiform" above, vs. the realistic drawing - at a time when the human hand and eye and brain were capable of the astonishing mental tour de force of drawing a bull or a horse on a flat wall as if it were a living, breathing, touchable animal. It has long been a tenet of biology that ontogeny recapitulates phylogeny, or that the young of the species demonstrates throughout its development, from embryo to adult, the unfolding of that whole biological group over evolutionary time. So, let's do some backward logic from child development to Paleolithic peoples. We may infer that Stone Age thinkers, like children at the developmental stage of about three years-old, must have been able to string words together at a time when they clearly show that they were capable of the make-believe of symbolic, abstract visual thought as meaningful marks in sophisticated drawings. It is likely that Stone Age thinkers were capable of metaphorical thought, too, expressed graphically and verbally, since their drawings place them beyond the abilities of most three year-old's drawings, who (at least in Sam's case, at age three), **can** produce verbal metaphors, but **not** shaded drawings.

At two years of age, my grandson, Ben, was just beginning to talk in one-word sentences. The fact that he was still not speaking much may have helped him to stay close, as a visual artist, to the visuo-neural shapes of thought. Ben's drawing shown on the next page - as his mother says - looks calligraphic, like the mark-making on a Chinese wall hanging, where an image is accompanied by a brief, explanatory "poem" presented by a few fluently formed "characters."



Ben, age two "Chinese Wall Hanging", two handed spirals



Hanging Scroll, "Bamboo in the Wind", Wu Zhen 1280-1354, Yuan Dynasty, 1350. Ink on paper. With permission of the Freer Gallery of Art, Smithsonian Institution, Washington, DC: Purchase, F1953.85.

For me, this drawing of Ben's on this page, shows three things:

- Ben is able to access one of the most powerful neural shapes of dynamic thought (the spiral).
- Because his mother reads to him and because Ben has many books, he knows that images are accompanied by text, or that two qualitatively different mark-making systems co-exist. His drawing has a large image with text-like additions on the lower right arranged vertically, very much like the Chinese characters on an illustrated scroll. In this sense, Ben and the Paleolithic cave artist (who - 13,000 to 17,000 years ago - produced "The Chinese Horse") and the artist, Wu Zhen, who created the Chinese scroll above, *Bamboo In the Wind*, are on the same cognitive representational level.

- Two to three year-olds are capable of both gross and fine motor control, including all-arm Gestalt drawings, and fingers-only, finely detailed drawing. Both of these kinds of drawings - large motor and fine motor - express the shapes of Ben's thoughts. The drawing-hand and the observing-eye and the thinking brain operate as a unit. The eye and visual cortex influence what the hand will draw and the drawing hand influences the refinement of what the eye and visual cortex can see, while the mutual work of hand and eye synchronize the global action in the brain into coherent patterns for symbolic thought.

The logic and the order of the shapes of little children's scribbles signal the ability of the eye in concert with the emotional system and the agency of the hand to generate a flexible repertoire of lines and shapes with which human beings alone transform themselves. The purpose of meaningful marks is creating new (presumably adaptive) ways of thinking and feeling and acting, new modes for motility (movement), adhesion (connection), and transduction (communication) - to use basic terms of biology. There will be more on evolutionary biology and mark-making in the forthcoming book presenting several lines of research supporting the theory and practice in this book: *The Scribble Hypothesis*.

The Scribbling Child

The scribbling child is, body and brain, "in the groove," in the sense of Mihaly Csikszentmihalyi's "flow" of focused, successful, joyful action. The child is a synchronous unity. Being in mind/body harmony and having pure intuitions of the harmonious shapes of focused thought, capable of the naive, artistic creations treasured so keenly by some adult visual artists (Arp, Miro, Klee), children achieve consciousness states which many of us long to recapture. How precious is that undistracted attention of childhood, that oneness of thought and action! Undivided focus and the formal integrity of line and shape are what mature artists seek to regain when they talk about the "naiveté" and "spontaneity" of child art. If we translate the longings of these artists into neurological terms, what they'd be saying is that they want to stay close to the neural shapes of coherent thought.

As an integrated unit, the young child's hand/eye/brain can capture and express on paper the very brain processes designed for motion, attachment and communication because the child is very little and very uninhibited (his prefrontal lobes have not yet started to censure emotions and behavior). The shapes the child captures on paper are universal because they record basic structures and processes common to all mammalian brain activity, along with structures and processes specific to speaking creatures who also use meaningful marks to communicate and think.

Future Research

Key to understanding how human brain activity differs from other species' brain activity is how marks of meaning not only reflect but reorganize the neural shapes of thought. This activity most probably has a special set of developmental wavelengths. Until we have a substantive body of research using brain scans of little children scribbling, speaking, drawing, writing and reading,

as well as doing mathematics and musical notation and compare such scans with vocalizing and gesturing and signing and button-pushing, even mark-making, in other species at similar developmental stages, we can only theorize about the qualitative differences in the brain patterns of the mark-making child as it acquires language from those of, say, young rhesus monkeys, macaques, cotton-top tamarins, vervets, bonobo apes, chimpanzees, bats, dolphins or whales.

Platonic vision plus Aristotelian vision

It is not just the search for enduring and characteristic properties (Zeki, 1999²⁵) that makes our visual cortices different, it is the marks-based ability to catch the flux, the ephemeral, the specific, the individual and idiosyncratic, the non-categorical that makes mark-making so interesting. We can afford to be interested in the inconstant, the changeable, the impermanent because we have figured out how to trap these visual fleeting impressions using marks.

This is where make-believe and spoken and written language and symbolic logic have their earliest beginnings.

At certain levels, the development of the human visual cortex is continuous with the visual brains of other primates. Tufted capuchin monkeys will make marks on clay with sticks and stone tools; chimpanzees will draw with pen and paper, paying attention to the marks they make.^{41,42}

So, at the level of intentional, self-pleasing mark-making or “Early Scribbling”, our aesthetics and our art are **not** unique to our species. This is significant information for an understanding of the continuity of the brain across species.

But here’s the point; visual intelligence is developmental. The “old saws” of evolutionary biology that organisms evolve over time in response to the environment and that adaptive behavior insures the survival of the adaptors still hold. Children’s scribbles show us that they begin life like other mammalian visual thinkers. They access general categories: general light/dark contrast, finer light/dark contrast or edges, things moving at certain frequencies, things colored at certain wavelengths, things this close, that far, this shape, that shape, this character, that character, this face, that face, this expression, that expression and, like other mammals, they learn to read these visual categories and conduct themselves accordingly. But children’s scribbles show us more than lines; they show us the shapes of Platonic solids (Euclidean 2- and 3-dimensional shapes: pyramids, squares, dodecahedrons), the basic shapes underlying or determining the physical structure of things in our universe and they show us little odds and ends, particular events, miniscule happenings recorded with careful precision by very young fingers.

How do young children discover Euclidean and non-Euclidean shapes all by themselves? From looking outward at things in the world or by looking inside their brains? What’s your experience with two year-olds? Do you show them how to draw spirals or do they draw them all by themselves?

Young scribblers are not looking out at objects in the world when they scribble. They are, neurally speaking, feeling their way into form. Their basic strategies for seeing are intuitive, inherent, built into the human visual system. Tufted capuchin monkeys may scribble, but they do

⁴¹Westergaard G.C., Kuhn H.E., Suomi S.J., Effect of upright posture on hand preference for reaching vs. the use of probing tools by tufted capuchins (*Cebus apella*). *American Journal of Primatology* 1998; 44:147-53.

⁴²Boysen S.T., Berntson, G.G., Prentice J., "Simian scribbles: a reappraisal in the chimpanzee (*Pan troglodytes*)," *Journal of Comparative Psychology*, 1987 Mar; 101(1):82-9.

not draw spirals, triangles or rectangles.

Until dolphins and whales use thought-waves to draw Euclidean and non-Euclidean shapes on lighted screens, we'll remain unsure about the basic brain patterns other creatures exhibit who share our universe's "time" and "space," or energy states, or how basic patterns change once creatures begin to speak and write and read. Whales may show the way through song.

We probably share many identical neural Platonic solids at the level of the nervous system with other mammals; other mammals just do not draw them so that we can see that fabulous winding and unwinding, twirling and untwirling, folding and unfolding dynamics of thought and being, which we share with all biological life, from proteins to wriggling puppies and wiggling babies.

There is "Zeki" Qualia seeing and there is "Sheridan" Quidditas seeing: Platonic visual thinking and Aristotelian visual thinking. Both begin with experience of the shapes of thought inside the brain. The child's brain begins with Zeki-categorical thinking, which it accesses through his brain-based scribbles and then, still through the agency of marks, progresses to Sheridan-particular/idiosyncratic visual thought as the child uses his eyes to trap and record in his drawings bits of information of interest in the world. As children move through Early, Middle and Mature stages of Scribbling and through Early, Middle and Mature stages of Drawing, their marks reveal the growing capabilities of their human visual cortices for ways of seeing and thinking. The drawing by Nadia of the horse and rider on page 52 is a good example of a fusion of Platonic and Aristolian visual qualities.

A chimpanzee's considered, intentional, boundary-bound lines are not Van Gogh's "Starry Night." They are not Debussy's "Prelude to a Fawn." They are not Seamus Heaney's poem, "Digging," nor are they Norman Rush's novel *Mating and Mortals*. Once brains learn to move, attach and communicate using marks of meaning, marks of meaning become neuro-biological requirements. Cutting humans off from meaningful visual forms of communication (including text as well as image, since text as words is visual first, phonemic or sound-based second), would be like hacking off a cell's pseudopods. Cells invented "false feet" to extend their cellular membranes for the express purpose of moving, attaching and communicating in response to the environment on which they depend. Our pseudopods are spoken and written language, including the arts, literature, mathematics, and music. Who would think of cutting off these outreach systems? Yet we have, for many children.

By linking the scribbling of children with brain activity, it is possible to build upon the work of Herbert Read, Rhoda Kellogg, Sylvia Fein, Alexander Marshalk, Dean Falk, Stanislas Dohaene, George Lakoff and Rachael Nunez, Maulfry Worthington and Elizabeth Carruthers, Linda Smith, Elizabeth Spelke, Margaret Livingstone, and Semir Zeki, creating a theory of scribbling. This theory mandates multiple literacies for all children.

There is a basic pattern, or an order to how universal shapes emerge in children's scribbles and drawings and these patterns persist in adult art. My contribution to Sylvia Fein's work is to take the art historical relevance of children's scribbles to neural levels. Similarly, I take Fein's "artistic logic and visual order," and provide a brain-based interpretation for them.

Lesson Plans for a Marks-based Literacy Program

Lesson Plans



Some of these lesson plans will be illustrated by drawings produced by Nikki Allen and her then 4.5 year-old son, Parker Phillips Allen. He is now eleven years old! When Parker was 2.5 years old, his scribbles, along with those of 1.5 year-old Josef Lee Guptill, inspired the paper “The Scribble Hypothesis,” 2000. The photographs of Nikki and Parker were taken by photographer-film-scene locator and father, Christopher Allen.



Parker, age 2 ½, “This is the baby. Do you see it?” ©2003 Nikki Allen



Nikki and Parker Phillip Allen at age 4.5, thinking about drawing

Key to instructional icons:



Drawing hand icon: Scribble, draw or write.



Sitting figures, face to face: Peer share by showing, talking, reading aloud.



Standing figures, hand in hand: Build vocabulary

Field Notes: Take notes on the child's development in connection with speech, mark-making, and emotional, social and motor skills. Do not worry if taking these notes is too burdensome! Just don't give up on the exercises!

Materials: paper and pencils or markers or colored pencils or crayons.

Make sure the paper is as long and as wide as the child can reach.

Remember: The child always gets to speak or read aloud first.

Using the word "because" forces us to explain our statements to ourselves, encouraging more analyses, tighter logic and clearer explanations. "Because" teaches the brain to press on in the search for meaning.

For Caregivers: Three Preliminary Memory exercises designed to help you understand the family dynamics when you were a child.

These exercises are for caregivers. They'll give you a chance to examine your own childhood, including how you were raised. You might decide that you want to be a different kind of caregiver. On the other hand, you might remember especially wonderful aspects of how your parents and/or caregivers raised you and want to recapture these aspects of your own childhood with other children.

The word "because" forces us to explain our statements to ourselves.

1st

Getting Ready: Warm-up Exercises for Caregivers

Remember your parents and/or caregivers.



**Draw your father.
Draw your mother.**

Do not worry if you think you do not know how to draw. Use stick figures. Use any kind of shapes and lines. Label the bits and pieces with words. Make sure you write your mother's and father's full names beside their drawings. Include as many distinguishing characteristics you can think of in both drawings and make sure to label them with words. If the words lead you to other words, follow them. Keep writing.

Write about your parents/caregivers.

What were they like? _____

How did they parent you? _____

Are you parenting/caregiving as your parents/caregivers parented you? _____

How? _____

Be specific _____

Would you change anything? _____

What would be the benefits of changing your parenting/professional caregiving style? _____

What would be the cost? _____

2nd

Remembering your childhood



Draw yourself as a little child.

In your drawing, include what you remember of your toys, and your house.



Draw your siblings, if any.

Label them with their names and any distinguishing characteristics you can think of.

Write about your relationships with each sibling.



Draw your pets.

Label every aspect with as many characteristics as you can think of.

Now, write about what effect your parents, other caregivers, siblings, pets, home had on your adult personality. _____

Are there any aspects of your personality you would change? _____
_____What and why? _____

Do you think you can prevent that trait from developing in the child in your care? _____

What is the cost of changing your own personality trait? _____

What is the benefit? _____

3rd

Wishful Thinking



Draw a picture of how childhood could be different and how parenting/caregiving could be different.

Imagine a plan for change. Draw it and write about it. Remember the importance of the word "because"!

Maybe it would help to start with a wish list:

I wish my childhood had been _____

because _____
 I wish my children's children could be _____

 _____ because _____
 To make my children's childhood and other children's childhoods different, I
 will have to _____
 because _____

Warm-up Exercises with Children Ages 1 to 3

These preliminary mark-making exercises are for caregivers and children together from the time the child can gesture and scribble, between one and two years of age.

There are two goals for these warm-up exercises. First, to achieve an attentive, mindful state. Second, to get a feeling for what mark-making is by doing it. You may think that part of the preparation for these exercises is deciding ahead of time what the child is capable of visually, verbally, mathematically and musically. It isn't. Don't over-analyze. Let the child explore, using marks. The child might just surprise you and invent algebra! Marks of meaning are part of the child's mental bag of tricks.



1) Scribble for two minutes. Talk and/or Write about:

How it feels to scribble:
 Scribbling makes me feel _____
 because _____
 What you think scribbling is:
 Scribbling is _____
 because _____
 What your scribbles are telling you:
 My scribbles tell me _____
 because _____



2) Draw for two minutes. Write about:

Drawing makes me feel _____
 because _____
 Drawing is _____
 because _____
 My drawings tell me _____
 because _____

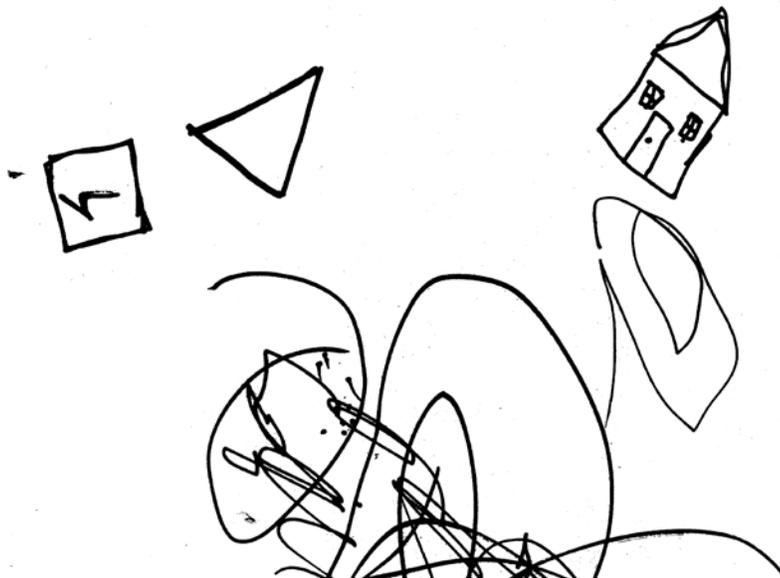


3) Write for two minutes. Write about:

Writing makes me feel _____
 because _____
 Writing is _____
 because _____
 My writing tells me _____
 because _____



Evan coming out of autism



Ben, age 2, and Jessica (the mother) doing a scribble dialogue



4) Do some math for two minutes: Write about:

Writing mathematics feels like _____
 because _____
 Mathematical notation is _____
 because _____
 My mathematical notation tells me: _____
 because _____

5) Do some musical notation for two minutes. Write about:

Writing music feels like _____
 because _____
 Musical notation is _____
 because _____
 Musical notation tells me _____
 because _____

Do not fall into the trap of being self-critical. For instance, it is not useful to write, “I am terrible at drawing and I can’t spell when it comes to writing.” Make the marks you remember that go with mathematics and with music, or, if you never learned anything about musical notation, make it up. Make your own marks for these categories. It is not your fault that you never learned these systems. As a caregiver, you are going to make sure children learn the basic vocabulary of mathematical and musical systems. On pages 204 through 212, we’ll learn something about the marks that stand for algebra and music. Anyone can learn to make these marks. If we can not entirely understand them, that’s OK. Maybe children will, if they learn them young enough. One thing we’ve learned from watching kids on the computer; they learn it faster and better than we do. They become our teachers. Chances are, it will be the same way with marks!

Early Work: Daily Scribbling With Children Ages 1 to 3

Provide the youngster with a piece of paper as big as the child’s reach and a soft (meaning soft lead, capable of dark marks), fat pencil or washable, fine or fat marker. You’ve read through an overview of the stages of scribbling on page 78 and 79. Review this section.

As you work with the child, think about what stage the child may be in: Early, Middle or High scribbling. If you are not sure, don’t worry. The point is that you now have a way to appreciate the different ways the little toddler makes marks. They’re no longer total gibberish to you! You may not be able to label the marks as Early, Middle or High period anything until the child moves out of the scribbling stage. Still, you have Rhoda Kellogg’s and Sylvia Fein’s categories to work with.

- 1) Scribble every day with the child for as long as the child wants to. This means anywhere from a few seconds to ten or fifteen minutes. Again, do not worry about this. When the child is tired of scribbling, the child will stop. Don’t rush the child, don’t pressure the child. We’re working with developmental stages. A child will find it very stressful if pressure is applied for a milestone it’s not ready for, whether that milestone is walking, talking, scribbling, or using the potty.



Jessica (the mother) and Ben doing scribble dialogue

- 2) Observe the child's marks, and, when the child is willing to listen - probably between the ages of two and three - identify them, using the vocabulary provided on pages 88, 94, and 126. We all talk to babies using words they can not possibly understand. Don't be shy about using the word "diagonal" in connection with scribbles. The word "diagonal" is basically no more difficult than the word "doggie" for the child.

The only differences between the word "doggie" and "diagonal" are two extra syllables and the fact that the dog moves and pants and woofs while a line does not. And a line is a thing the child has made, while a dog is not!



- 3) Scribble yourself, keeping up a quiet, non-distracting running commentary about your lines and shapes. If you see something else in your scribbles, like some fantastic creature, you might want to talk about it. Just be careful not to take over. Remember who the scribbling is mostly for.
- 4) Enter into visual scribbling dialogues with the pre-verbal mark-maker like the ones my daughter, Jessica, and her son, Ben, created shown above and on page 148. Let the child make marks around your marks and even on your marks. It is best not to draw on the child's marks. Still, you could draw a shape near the child's marks, as a question or as a response.
- 5) Take Field Notes on what the child is doing as a scribbler, talker, interactor. You might take a few notes on yourself in these categories, too.

Field Notes:

Make sure your Field Notes are dated. Use the box on the next page.

1. Include comments on how long the child scribbled, where the child was looking during scribbling and anything else you actually observed.
2. Then, make a guess about what you think is going on in the child's brain. Back statements up with the "because" clause. This will force you to stick to observable facts as the basis for your speculations.
3. Date the child's scribble. Do the same for your own scribble - and you might add how long you scribbled, where you looked, what you thought and said about your scribbling.
4. If you are concerned about environmental influences in the child's life, this is a good time to take notes on what the child ate, what shots he had, how much TV he watched, how much computer time he had, how long he slept, how his moods are, his attention spans, his language use, his motor skills. You might pick up a little warning sign. Mostly, you will be noting down the normal events of the day. You will be keeping a log of information for the future, should you need it.



Parker, "Telling Mommy what the pictures are."

"Drawing is the discipline by which I constantly rediscover the world"

Frederick Franck,
The Zen of Seeing, 1973

Saving Literacy

Take your field notes.

A large, empty rectangular box with a thin black border, intended for taking field notes. It occupies the central portion of the page.

Starting the Drawing/Writing Program



Beginning Benchmarks for Mark-making, Attention, Mood and Behavior

Physical activity, talkativeness, attentiveness, mood, and emotion, playfulness, curiosity

More Warm-ups:

Drawing in the Air
Tracing/Talking/Writing

Preliminary Drawing and Writing

Lesson Plan I

Step One: *Contour*

Blind Contour
Regular Contour

Lesson Plan II

Step Two: *Basic Shapes*

Euclidean
Organic
Fractal

Lesson Plan III

Step Three: *Light/Medium/Dark*

Lesson Plan IV

Step Four: *The “Perfect” Whole*

Lesson Plan V

Step Five: *The Composite Abstraction, CA #1 and CA #2*

Closing Drawing and Writing: Quick Evaluation

Closing Benchmarks: Quick Evaluation

Physical activity, talkativeness, attentiveness, mood, and emotion, playfulness, curiosity

How Caregivers and Children Feel About Mark-making Now

Beginning Benchmarks for Mark-making, Attention, Mood and Behavior

Now let's evaluate your child for behavior, attention, mood and emotion, curiosity, playfulness. We will be looking at the following categories for changes in mood and behavior, including speech, as well as in mark-making skills:

Evaluating the child's level of attentiveness to marks:

- Length of time the child will engage in scribbling? _____
- In drawing?_____
- In pre-writing?_____
- In writing?_____
- In reading?_____
- Using Kellogg's examples in this book, comment on the range of the child's scribbles? 1-10?_____

Comment on the range of the child's drawings? 1-10? Describe the range of invented spelling or use of the alphabet?

List letters and words _____

- Describe the range of the use of numbers? List numbers _____
- What is the child's physical activity level? Scale of 1-10_____.
- What is the child's talkativeness level? Scale 1-10_____.
- What is the child's level of alertness, attentiveness? Scale of 1-10_____.
- What is the child's cheerfulness level? Scale of 1-10_____.
- What is the child's core characteristic? Shy, outgoing, happy, sad, angry/irritable, calm/peaceful, withdrawn, curious?_____
- What is the child's level of playfulness? Scale of 1-10_____.
- What is the child's level of curiosity, adventuresomeness? Scale of 1-10__.

Let's fill in these categories now, providing initial baselines before trying the Scribbling/Drawing/Writing exercises.



What Can Caregivers Do To Help!

Treat tracing-in-the-air and tracing-on-paper with respect. Tracing is feeling one's way carefully around the object by gesturing and then by drawing. It is a great way to learn about a new object.

Warm-Up One: Drawing in the Air

1. Stand up.
2. Hold your object in your hands.
3. Close your eyes.
4. With one hand, feel your way around the object.
5. Keeping that felt path in mind, "draw" your object in the air.
6. Make a big drawing using your whole arm.

The precedent for “Drawing in the Air” is the way Chinese children are taught to learn their alphabet, or characters, by drawing them first in the air using large gestures.

Warm-Up Two: Tracing/Talking/Writing

Note: The child will either talk about the drawing or use invented spelling or use formal writing, depending upon his or her stage of development. As the caregiver, you will write.

1. Place your object on a piece of legal-size paper.
2. Put the date and your name on the piece of paper.

Artists and writers sign and date their work.

3. Put the term “Tracing/Writing” on the top.
You will give your work this title as a way to identify it.
4. Trace around your object.

Now write in this manner;

“My tracing of my object tells me that my object is _____
because_____”

The line tells you that your object is curving, sharp, angular, bumpy, etc. The “because” clause forces you to explain what bumpiness is. You are going to have to describe “bumpy” in words. This explanation will refine your logic system and build your vocabulary.

Tracing is not cheating. It is intelligent behavior. What is wrong with drawing your way around something with a mark-making tool to get an accurate copy? The young child who traces is exhibiting intelligent behavior.



Peer Share with the child. Let the child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

If children at around the age of five or six trace some images from art history books, the child will absorb spatial grammar, or the compositional structure of the art work. Many artists copy great masters to learn. This is what I did with my middle school English students, using a text instead of a painting. I had them “trace” a great work of literature to learn its formal grammatical structure. We used Paul Gallico’s novella, “Snow Goose,” and we modeled the first chapter grammatically, or “traced” it. Each student wrote his own description of a familiar place, using Gallico’s structure. Where Gallico used a noun, my students used a noun. Where Gallico used an adjective, my students used an adjective too. (See Part Four of the handbook for teachers *Drawing/Writing and the New Literacy*, 1997, for more information on teaching English using

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Drawing/Writing.) My students pieces modeled Gallico's prose grammatically. This meant that each young writer turned out a piece of personal, yet highly professional prose. The child's brain absorbed the compositional structure of Gallico's prose. As each student read his piece of writing aloud, the sound was symphonic. The children were heady with the way words could be organized! We can trace physical objects in a drawing exercise and we can "trace" a piece of literature in a writing exercise to learn about it's fundamental structure.

Because spatial thinking supports linguistic thinking, tracing objects and "tracing" text will not only effect the child's ability to draw coherently, but to speak and write words coherently, too.

Drawing with children

"The purpose of 'looking' is to survive, to cope, to manipulate, to discern what is useful, agreeable, or threatening to the Me, what enhances or what diminishes the Me. This we are trained to do from our first day ...It is in order to really SEE, to SEE ever deeper, ever more intensely, hence to be fully aware and alive, that I draw... Drawing is the discipline by which I constantly rediscover the world... I have learned that what I have not drawn I have never really seen, and that when I start drawing an ordinary thing I realize how extraordinary it is."

Frederick Franck, The Zen of Seeing, 1973. New York: Vintage Books

"Drawing is the principal means by which we organize the world visually. We use it to work out ideas of all sorts, collect information and analyze the way we see things in order to plan, instruct or speculate. Through drawing, we are led to 'see' and to understand."

Ron Bowen, Drawing Master Class, New York, Random House. 1992.

Starting the Five-Step Drawing/Writing Lesson Plans

Materials: pencils, markers, legal-size paper, legal-size file folders, objects of interest with dignity and power (like kitchen implements, tools, bones, and shells). If your child is pre-literate, you might use a tape recorder to record the talk that accompanies the drawing or even a video camera. The only reason for recording the sessions would be for research purposes or to set up a situation where the child can see himself or herself grow over time. Basically, working side-by-side with the child is all you need to do.

Procedure:

1. Choose an object.

You will work with the same object for all five steps, practicing commitment.

2. Get a stack of legal size paper, a set of manila legal-size folders, a range of drawing tools, including pencils, crayons, markers.
3. Clear off a surface for drawing and writing.
4. Turn off the TV and the computer and any other machines. Use natural light if possible.
5. Pick the quietest room in the house to work in.

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so that the number and kind of spoken words can be compared with the child's talk later in the process.

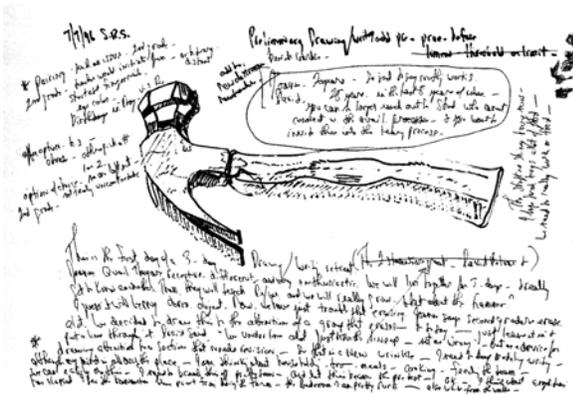
There are no rights or wrongs about how to do this drawing and writing. Do not make any suggestions to the child. Do not talk to yourself about how bad your drawing or your writing is.



Peer sharing means the child holds up her drawing and talks about it. Then, you get to talk about the drawing by noting areas you find successful, or appealing, and why.

If you find an area that seems unsure or unfinished, approach that area by asking a tactful, open question. Be very careful not to be negatively critical. But do ask questions. After the child shares, it's your turn to share your work. When it comes to your own work, be critical in a matter-of-fact, backed-up way. Do not say, for instance, "My drawing is terrible." Say, "I think I could have improved this section by looking more carefully at the shape of my object."

Children need to learn to be self-critical. Unremitting praise does them no good. A child who is led to believe that every mark he makes, every word he says, every action of his is marvelous and good is being set up for grave disappointments later in life, as well as for appearing "stuck on himself," or egotistical. Egotistical people are solitary souls.



Preliminary Drawing and Writing, Hammer, SRS



Preliminary Drawing and Writing, Lacrosse Glove, SRS

The Purpose of the Preliminary Drawing and Talking/Writing:

The Preliminary Drawing/Writing, including talking about drawing, gives you and the child a drawing and writing sample. This sample will be compared with another drawing and writing sample at the end of these exercises. The Preliminary Drawing and Writing and Talking about Drawing only measures skills for one moment in time and space, not for a lifetime. It's not a test!

Photo by © Andres Rodriguez

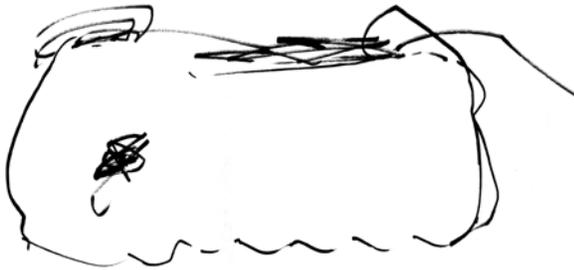


Take your Field Notes.

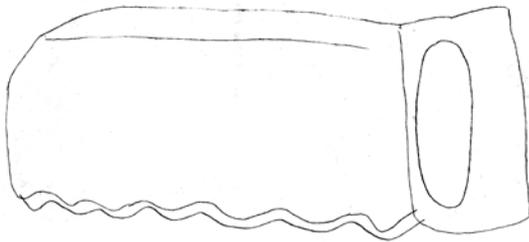
A large, empty rectangular box with a thin black border, intended for students to write their field notes. It occupies the central portion of the page.

A Four Year-Old's Preliminary Drawing and Writing

Here's how a four and one-half year old began the Five Steps of Drawing/Writing with his mother, Nikki. Both of them are drawing a handsaw.



Preliminary drawing of saw by Parker Phillips Allen, 4.5 years old.



Preliminary drawing of saw by Nikki Allen

Preliminary Drawing

Parker said, "I don't know how to."

Nikki asked, "What do you see?"

Parker said, "I see that I have to do, lines above."



Peer Share

Parker said about his drawing, "This picture is with a sharp thing like a saw. The handle is a little wishy-washy. But I don't know what is happening. But I see some orbits."

Nikki said about her drawing, "This is the handle and here is the blade. It sort of reminds me of waves."

Parker said, "Your picture is pretty organized. Now can we talk about my picture again?"

Nikki said, "Sure."

Parker said, "There's lots of crazy things on my picture because I can draw whatever I want."

A Four Year-Old Tries the Blind Contour

This is the first formal drawing in the Lesson Plans ahead.

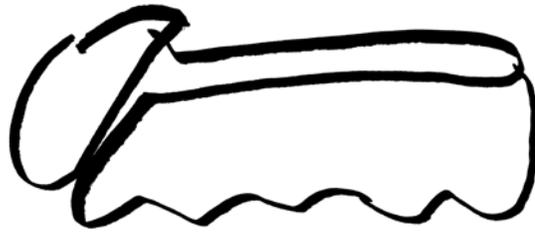
Parker said, "A saw, I drew a different saw. Little curves are on this. But I don't know what is going on with this hole."

Nikki and Parker now did the Blind Contour.

Parker said, "Little cracks are on this."



Parker's blind contour drawing of saw



Nikki's blind contour drawing of saw

Nikki said about her contour drawing of the saw, shown above, "This saw does not have sharp edges. It can just flatten things."

This is as far as Nikki and Parker got. Nikki wrote, "Hi Susan, this was really difficult to do with Parker. He's in a rebellious state of mind. I think we'll try another spontaneous drawing."

Parker drew the image below and then wrote his name. He was very upset by how it turned out, with two A's in his name, instead of one. Getting upset is part of the critical process of language-based thought.

What happens when the child becomes frustrated; Parker's mom suggested a spontaneous drawing. Brilliant idea!



*Spontaneous drawing by Parker Phillips
Allen, 4.5*

Parker said, "I want to do it first before I draw it." This comment is interesting. Parker seems to be indicating that thinking/visualizing the drawing before he actually does the drawing is part of the process. Parker suggests that his drawing or his signature may be more accurate if he thinks first. On the next page, in the photo of Parker, where he holding up his marker, you can see that he is thinking about the idea of pre-thinking his spontaneous drawing and/or his signature. That's pretty amazing! Thinking about thinking is called meta-cognition. Humans can do it because of language and literacy.



"I want to get rid of this disgusting name," Parker Phillips Allen

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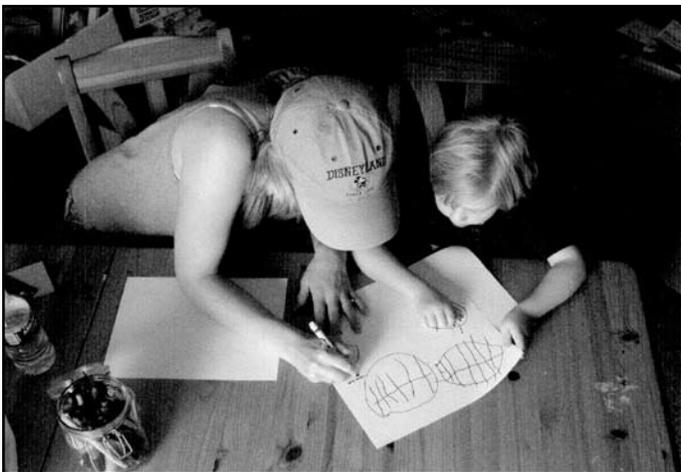


Nikki and Parker, Spontaneous Drawing

“I want to do it first before I draw it,” May 26, 2003, Parker at 4.5 years old



“Mommy Writing them Down”



“Telling Mommy What the Pictures Are”

Lesson Plan I

Step One

CONTOUR

BLIND CONTOUR



Parker Blind Contour of a saw, age 2

1. You and the child will take another sheet of paper and do this exercise.
2. Now, choose a magic marker. You will be using magic markers until we get to The “Perfect” Whole drawing. By using markers, you and the child will be practicing risk-taking, courage and commitment.
3. Add your name and the date.
4. Write the title “Blind Contour” at the top of the paper. Look at your object. Do not look at the paper. You are “blind” to the paper.
5. Without looking at the paper, while looking carefully at your object, draw a line that goes around the object, starting at one point and not stopping until you get back to that same point. You are trying to draw a profile, or an outline of your object.
6. With this drawing and with every drawing after this one, you and the child will each be doing the work. Make sure that you spend time carefully explaining each Drawing/Writing step. Always let the child go first when it comes to drawing, talking or writing. If your child is not writing yet, make sure you label each drawing with it’s title, with the date, and with the name of the child. If the child is able to do any invented spelling, let the child do his own writing, including dating the drawing and placing his name on the work.

Your drawing may not come out the way you thought it would. Do not be discouraged. You are learning to see. You are learning to really look at an object as practice for looking at the world. Instead of going through life with vague and approximate ideas, you are going to train yourself and the child to see what is actually there. Because each of us sees the world differently,

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no two visions of the world are going to be exactly alike. But our visions need to be accurate enough to allow us to interact successfully and effectively.

Now, write: "My blind contour drawing tells me that my object is _____ because _____"

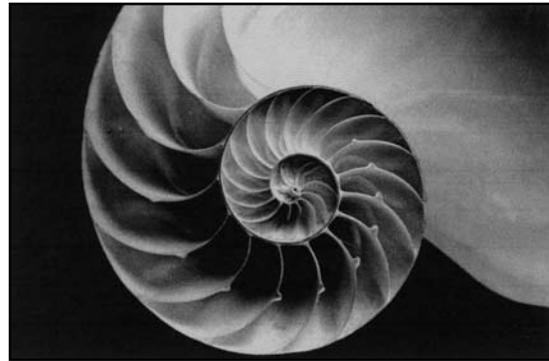
Now add two new items, a simile and a metaphor. Simile and metaphor are both methods for comparing one thing with another thing, using words.

A simile uses the words "like" or "as": "My shell is like water going down a drain because it has a spiral construction."

A metaphor makes a comparison without using the words "like" or "as." "My shell is water going down a drain because it has a spiral construction."



Parker Blind Contour of a saw, age 2



Chambered Nautilus, photo © 1997, Elizabeth Nyman.

I put my friend, Liz Nyman's, photograph of a chambered nautilus shell on this page to compare it with the spiral in Parker's Blind Contour drawing of a saw. How strange! How wonderful!

You may have to turn your drawing around and around to see something to use in your simile and metaphor. Try practicing with clouds the next time you are outside. What do they remind you of?

Simile: My blind contour drawing looks like a _____ because _____

Looking at Parker's Blind Contour of a Saw, what do you see? _____

Simile: Parker's blind contour drawing of a saw looks **like** _____ because _____

Metaphor: Parker's blind contour drawing **is** a _____ because _____

Why do a contour drawing? A simple outline drawing creates what is called a figure/ground distinction. Your outline encloses a shape. This shape is called the figure. Everything around it is called the ground. This simple drawing is practice in choosing and isolating and focusing on one single thing.

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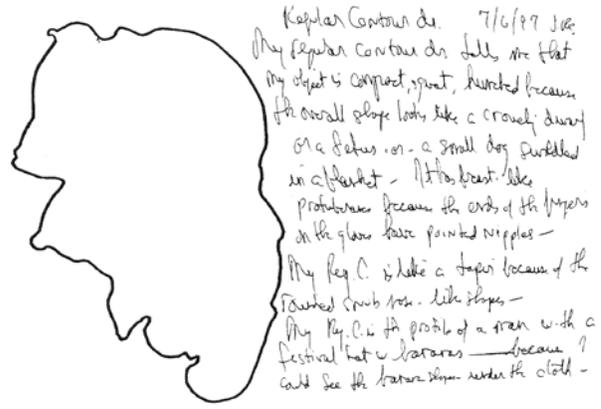
Peer Share with the child. Let the child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

Take your Field Notes.

REGULAR CONTOUR



Regular Contour drawing, lacrosse glove, SRS

1. You and the child will take another sheet of paper and do this exercise. **Continue to use markers, practicing commitment and courage.**
2. Put your name and the date on the paper.
3. Write the title “Regular Contour.”

Now, do an outline drawing of your object looking at the object AND at the paper. This way you can judge spatial relationships: how far is it from this to that on my object? You should be making some gains in terms of accuracy. Keep paying careful attention to your object. Don't draw automatically. You still have a huge amount to learn about your object.



Draw your outline slowly. Register every little in and out, every bump and curve.

Now, write,

“My regular contour drawing tells me that my object is _____ because _____

Write a **simile**: “My regular contour drawing looks like a _____ because _____

Write a **metaphor**: “My regular contour drawing is a _____ because _____



Peer Share with the child. Let the child go first.

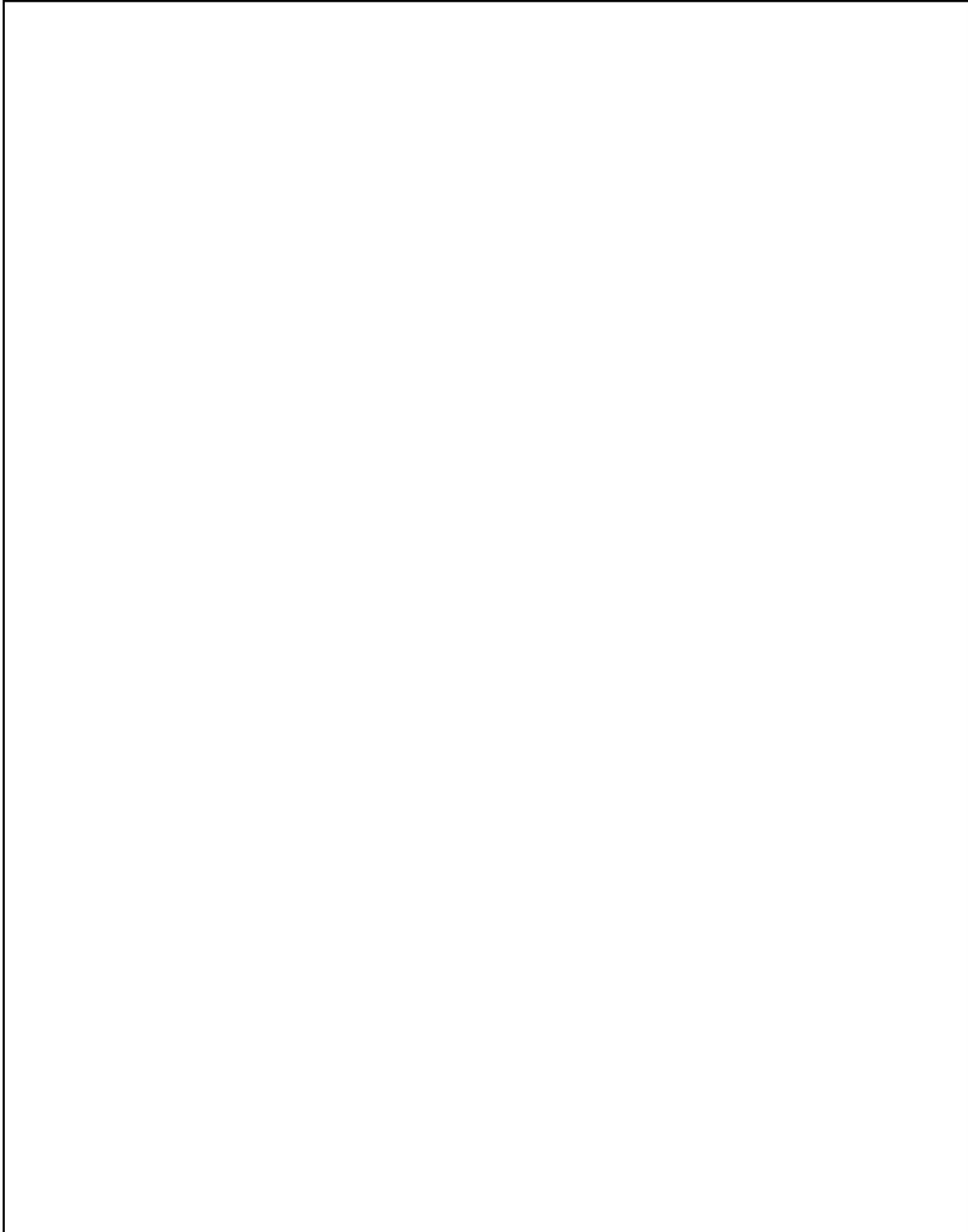


Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from

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her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

Take your Field Notes.

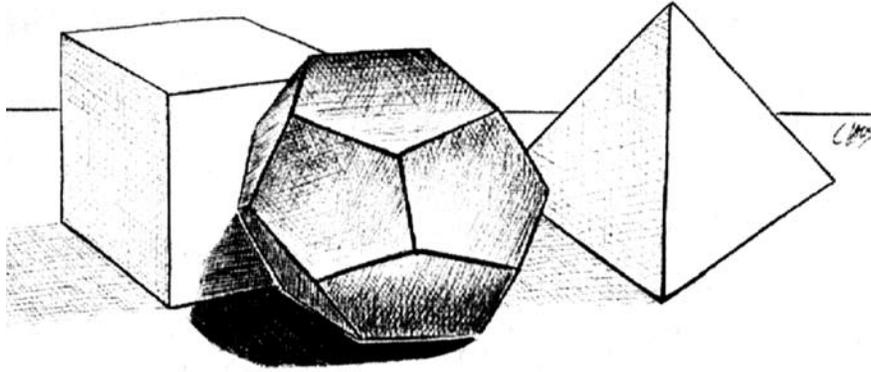
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Lesson Plan II

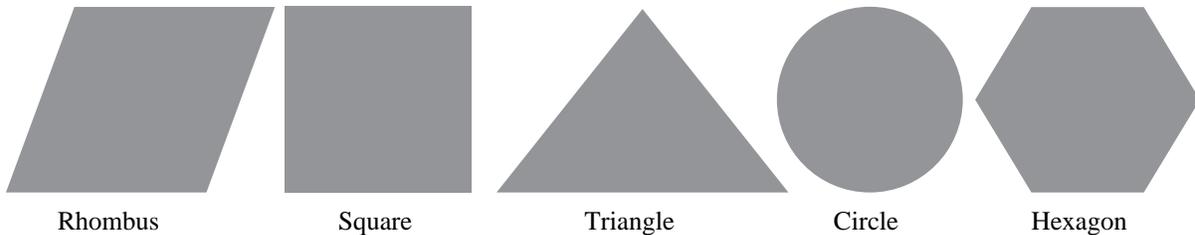
Step Two

BASIC GEOMETRIC SHAPES

Euclidean Basic Shapes



Cube, pyramid, dodecahedron, Claus Kormannshaus©, 1997



Rhombus

Square

Triangle

Circle

Hexagon

1. You and the child will take another sheet of paper and do a Euclidean Basic Shapes drawing. Stay with markers.
2. Put your name and the date on the paper.
3. Write the title "Euclidean Basic Shapes".

What does Euclidean mean? Euclidean means lines and shapes which follow certain rules.

For instance, in the Euclidean system, one line and only one can be drawn parallel to another line through a point, and the shortest distance between two points is a straight line. The easiest

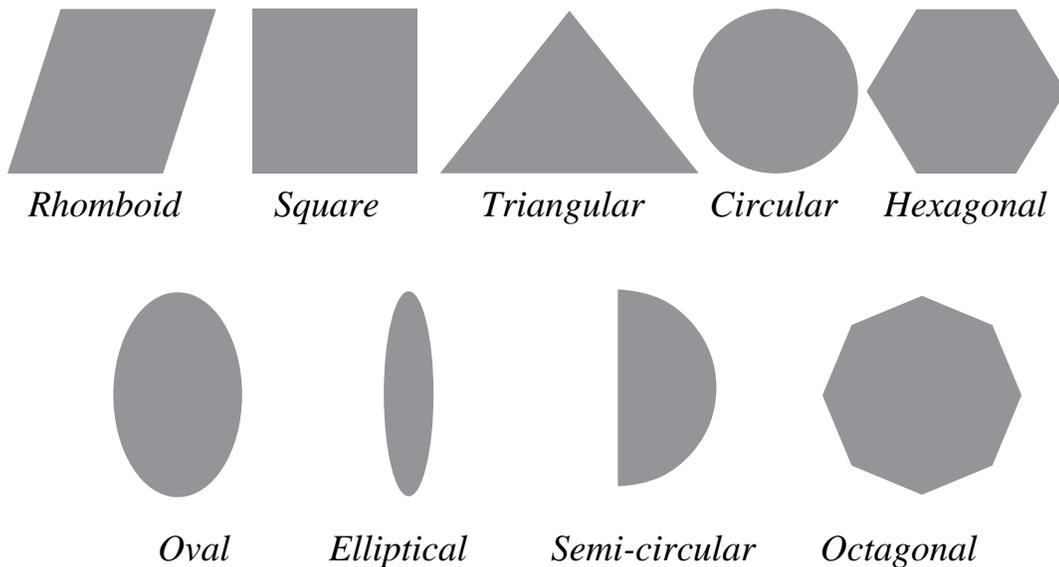
way to think about Euclidean geometry is to think about building a house on a flat surface where right angles and parallel walls are possible.

Generally, we think of Euclidean shapes as the shapes of childhood building blocks: semi-circles, squares, rectangles, trapezoids, triangles, cylinders. These shapes are not free-form, not amorphous nor amoeba-like.

Photo by ©Monica Adamczyk



Basic Euclidean Shapes with their Adjectives



Now, let's do a Euclidean Basic Shapes drawing.

With the basic shape, you will move from the outside surface of your object (which you have explored using contour drawings) to the inside of your object, via imagination. You may or may not be able to take your object apart, but you are going to think about your object as if it were built of the shapes you played with as a little child: circles, ovals, ellipses, triangles, squares, rectangles, rhombuses, trapezoids, parallelograms, pentagons, hexagons, octagons.

Practice these shapes at the top of the page and label them, adding the adjectives that go with them: circular, oval, elliptical, triangular.

Write: "My Euclidean Basic Shapes drawing is circular, triangular... "(and so forth, writing down all of the adjectives that go with the shapes you've used).
 Write: "I note that my Euclidean Basic Shapes drawing has _____ number of circles, _____ number of triangles" (and so forth).

These numbers tell me that my object lends itself most to triangles (or whatever shape occurs the most in your drawings) because _____

(Give the reason, for instance, why triangles (for example) are appropriate shapes for describing your object.)

Write a simile:

"My Euclidean Basic Shapes drawing looks like a _____
 because _____

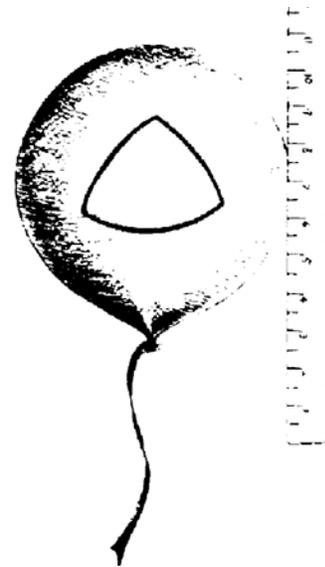
Write a metaphor:

"My Euclidean Basic Shapes drawing is a _____
 because _____

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Did you notice that many Euclidean shapes have sharp angles and straight lines? This geometry is appropriate for flat surfaces. Our world feels flat locally and works flat locally. We can build a house using straight lines and right angles. Put a ruler on a balloon. Can you measure distance on the balloon? You would need a different tool, a curving one, and a different geometry.

We know that our earth is curved, globally. It is a spinning ball in space. Other Non-Euclidean geometries have been invented to measure and describe curved surfaces.



Balloon, Non-Euclidean drawing of a triangle, Claus Kormannshaus, © 1997

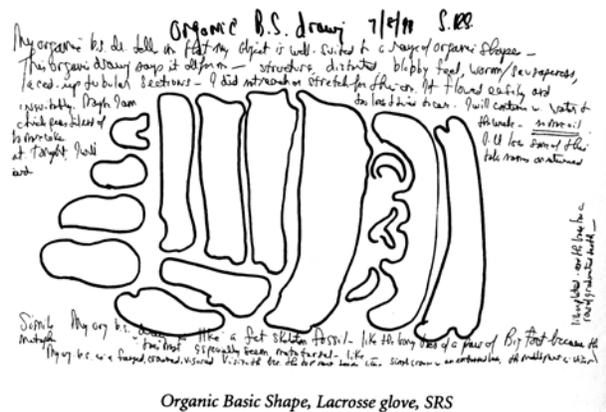
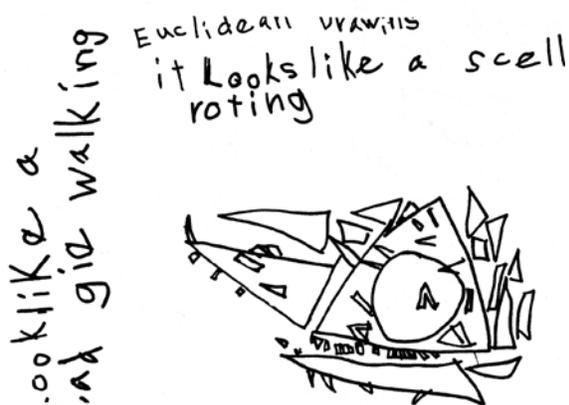


Peer Share with the child. Let the child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words.

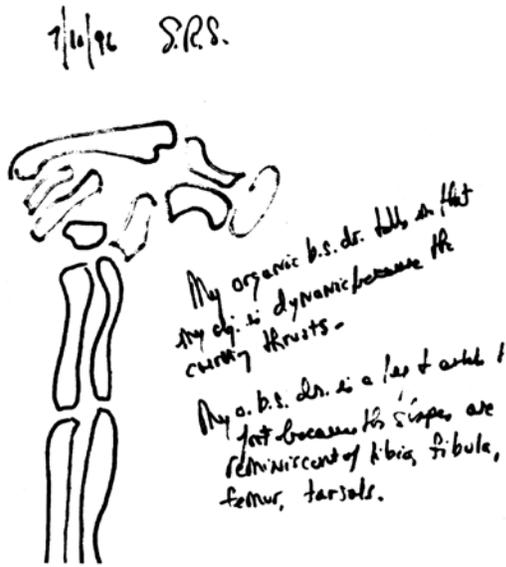
If the child is old enough to read, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.



Take your Field Notes.

A large, empty rectangular box with a thin black border, intended for students to write their field notes. It occupies the central portion of the page.

Organic Basic Shapes



Organic Basic Shapes, hammer, SRS

1. You and the child will take another sheet of paper and do this exercise. Keep using markers.
2. Put your name and the date on it.
3. Title it "Organic Basic Shape."

Why do an Organic Basic Shapes drawing? Art teachers use two terms: organic and geometric. Geometric means shapes with straight lines and sharp angles. Organic means shapes that are curving and blobby. Organic drawings are free-form. They have soft edges and curves. They are biomorphic, or "life-shaped," like an amoeba. "Organic" is an adjective describing living things. Most living things do not have straight lines and sharp angles. So we do the Organic Basic Shapes drawing for contrast and variety, and also for truth. Our world is made up of objects that are both geometric and organic.

1. Draw your object using the closed curvy shapes you actually see in your object.
2. Write: "My Organic Basic Shapes drawing tells me that my object is _____ because _____
Simile: "My Organic Basic Shapes drawing is like a _____ because _____
Metaphor: "My Organic Basic Shapes drawing is a _____ because _____"



Peer Share with the child. Let the child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough to read, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

Tip: You can try using your contour drawing as "the seed" in the following fractal drawing.

Take your Field Notes.

A large, empty rectangular box with a thin black border, intended for students to write their field notes. It occupies the central portion of the page.



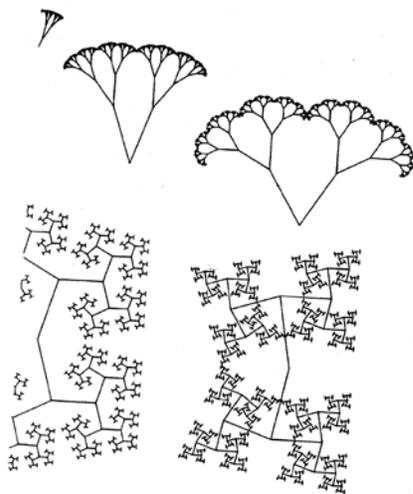
Fractal Basic Shapes



Fractal Basic Shape, Keith Palmer, © 1997. Second grade, Applewide School. Keith wrote, "looks like a worm digging out of the ground... looks like a spine and a back."



From *Turtle Geometry* by Harold Abelson and Andrea diSessa. Copyright © 1980. Reprinted by permission of MIT Press.



Fractal Tree, from *The Fractal Geometry of Nature* by Dr. Benoit B. Mandelbrot ©1977, Benoit B. Mandelbrot. Reprinted by permission of Dr. Mandelbrot.

1. You and the child will take another sheet of paper and do this exercise. Stay with markers.
2. Put your name and the date and the title "Fractal Basic Shapes" on the paper. We are now going to do a third Basic Shapes drawing.

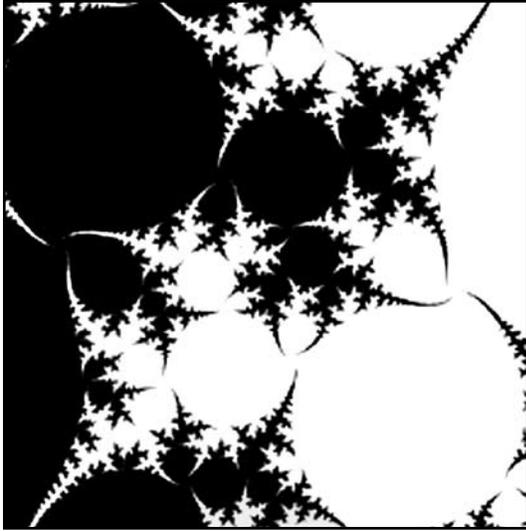
Look at this computer-generated drawing of a tree. A tree can be drawn by putting copies of itself together.

There is a geometry called fractal geometry, which is appropriate for describing natural things like clouds or trees or mountains. The same bits, used over and over, at small scales and at large scales, build up an entire image.

An inter-disciplinary thinker named Dr. Benoit Mandelbrot discovered the relevance of a strange seemingly useless geometry. He named it fractal geometry because it used pieces, or fractions, to create wholes. The verb "frango, frangere" means "to break."

Computers have made it easy to take a mathematical statement, repeat it a zillion times and watch what happens. A fractal operation is gorgeous. Paisley shawls, seahorse coves! The image on the following page is generated by the Mandelbrot set. See the repeating black "ladybug?" It looks the same across scales. It looks like the same ladybug whether it's big or small. Did you notice that the black ladybug is decorated with herself? Like a fugue, like a snowflake, the ladybug is decorated with copies of herself.

Fractal geometry creates complex patterns by using a "seed," then repeating the seed over and over again. In effect, the seed calls itself back, using what is called a recursive program. A baby is built using a seed called DNA and a recursive program which could be called "grow a whole human being". The seed responds to the command "divide by replicating," and then self-modifies as the embryonic mass increases, creating cells that differentiate. Fractal objects are complicated systems.



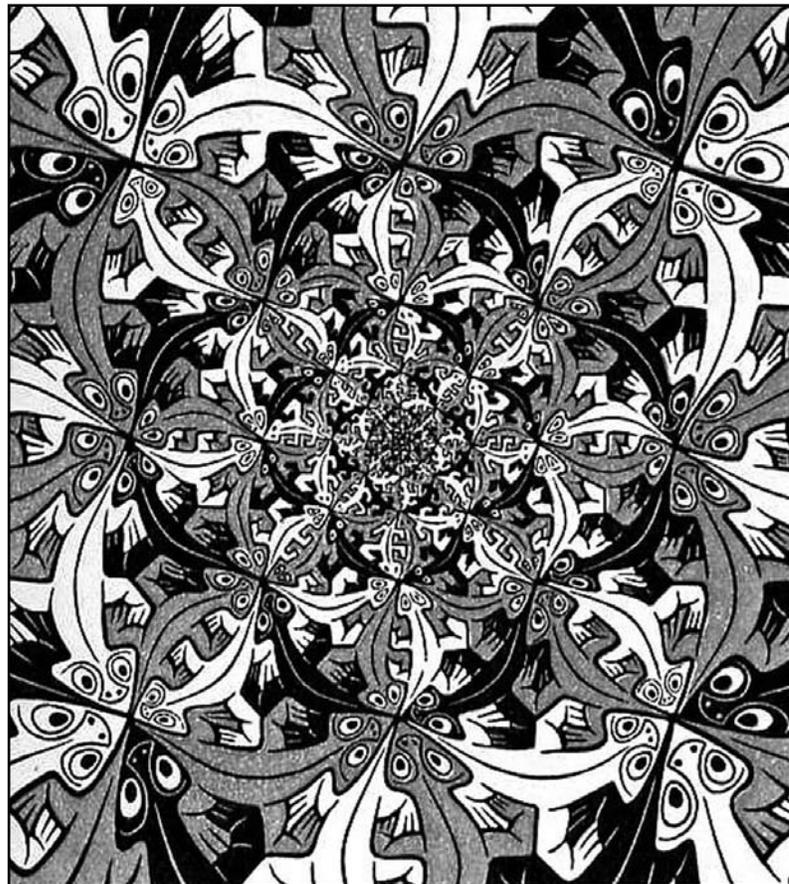
The "ladybug" or "apple" in the Mandelbrot Set from THE FRACTAL GEOMETRY OF NATURE by Dr. Benoit B. Mandelbrot. Copyright © 1977, Benoit B. Mandelbrot Reprinted by permission of Dr. Mandelbrot.

The brain is a fractal object and it is also a fractal process.

Fractals and chaos theory go together. Chaos theory says that things we used to think were indescribably messy like mountains or trees or clouds or the weather - or brain activity - actually have patterns, although sometimes, as with the weather, the repeating patterns are so far apart it's hard to see them.

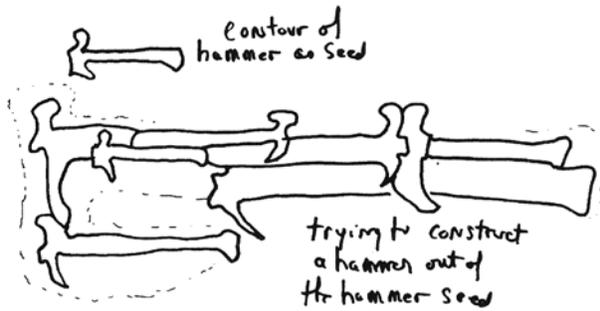
Chaos theory and fractal processes are sensitive to change. A tiny input has huge implications for the whole system. A small amount of a toxic substance, introduced at a certain time during a pregnancy, can harm the brain or body of the baby for her lifetime. On a more positive note, one small, new thought can thaw a lifetime of frozen thinking.

Fractal geometry is relevant for our lives. That's why, even though it's hard using just a marker and

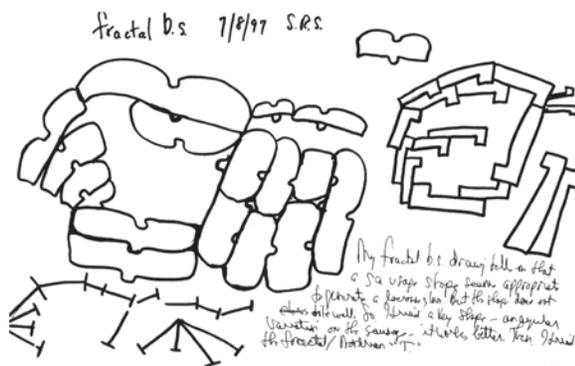


Escher, M.C., "Smaller and Smaller" © 1996 CordonArt, Baarn, Holland. Permission by Cordon Art B.V. All rights, reserved.

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Fractal drawing of hammer using contour drawing of the hammer as the "seed," SRS



Fractal drawing, lacrosse glove, SRS

a piece of paper and an object to achieve a fractal drawing, you and the child will practice it.

Try using a simple shape, like a triangle. The challenge is to construct the entire object, using one "seed" (or this triangle) that looks the same, large or small and that fits together with no space left over. Only a few shapes "tile the plane," fitting together without any space left over: squares, triangles, hexagons are three of these. The artist MC Escher was a genius at tiling the plane using things like lizards!

Look at the MC Escher image on the previous page. Lizards, big and small, fill the space. Doesn't this image give you a sense of an on-going, infinite process? Your brain is an on-going process, too, without end in this sense, a self-correcting, self-contained system, like a tree, like a snowstorm. Yet, paradoxically, that brain system allows us to be part of all the energy that is, part of all the patterns that are.

Write:

"My Fractal Basic Shapes drawing tells me that my object is _____ because _____"

Simile:

My Fractal Basic Shapes drawing looks like a _____ because _____"

Metaphor:

My Fractal Basic Shapes is like a _____ because _____"



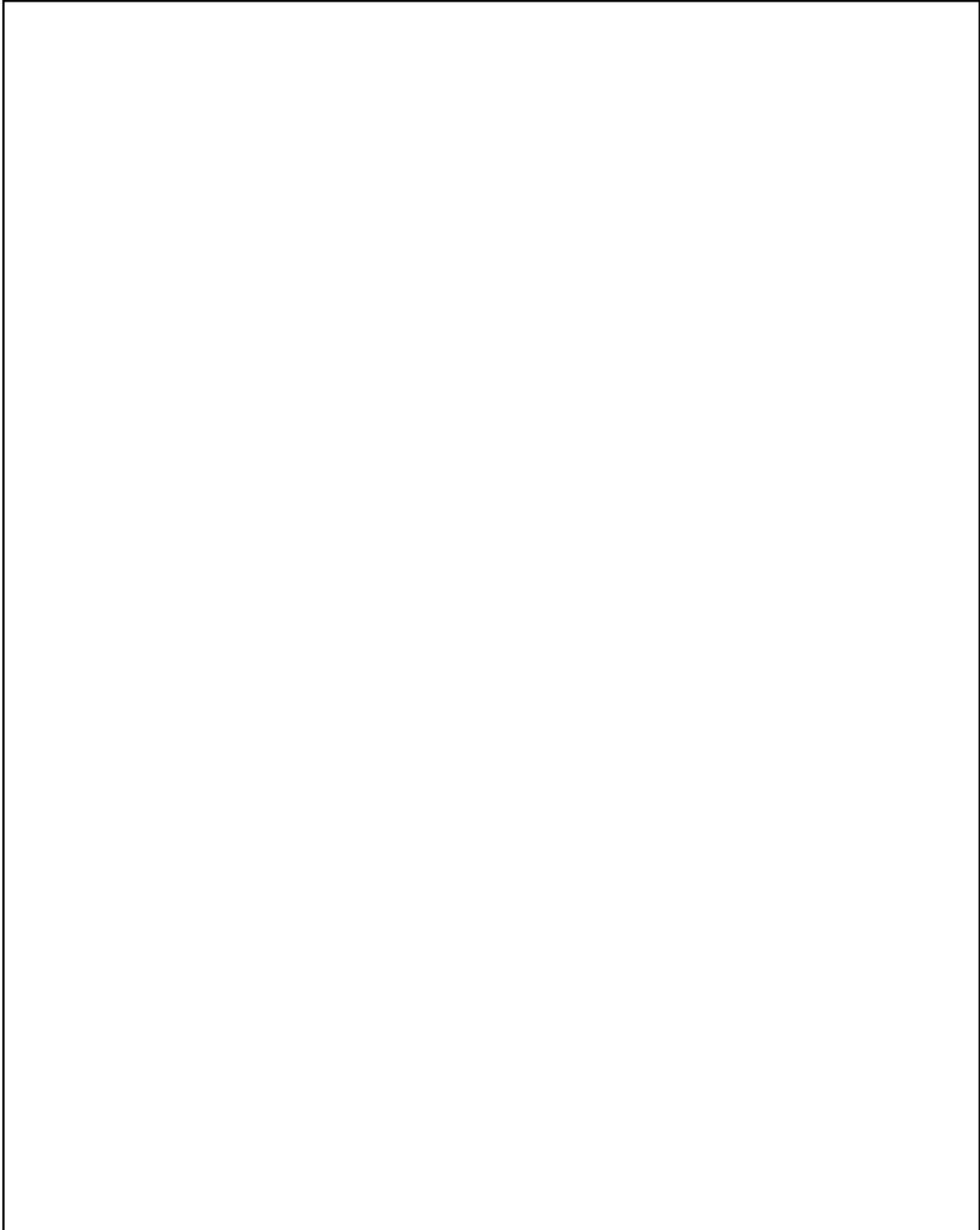
Peer Share with the child. Let the child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her

talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

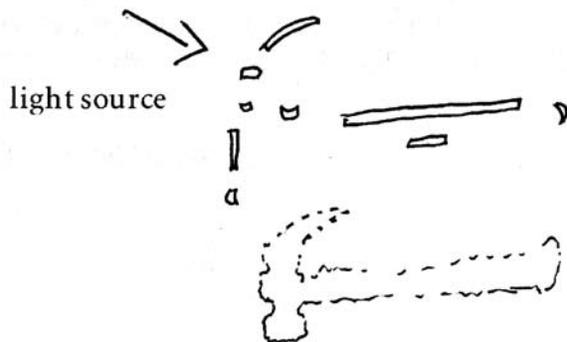
Take your Field Notes.

A large, empty rectangular box with a thin black border, intended for students to write their field notes. The box occupies most of the page's vertical space below the instructions.

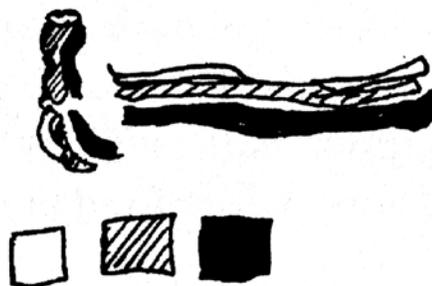
Lesson Plan III

Step Three

LIGHT/MEDIUM/DARK



Highlights of a hammer, with imaginary line of hammer held in the drawer's mind's eye. SRS



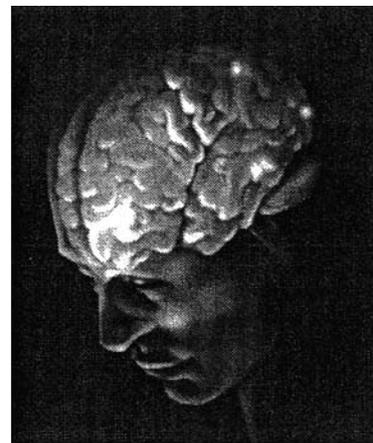
The hammer is constructed with actual shapes of light, middle and dark values.

We are going to see how light hits your object, making it light in some areas, dark in others. If you can draw the lights and darks, your object is going to start looking real, as if it were three-dimensional, as if you could touch it. Look at this image of the thinking head. Why does it seem so real?

1. Take a piece of paper and keep using markers.
2. Put your name and date on the paper and add the title "Light/Medium/Dark."

By using markers, we are not going to get a softly rendered drawing. We are going to get a bold value study, a study in sharp-edged lights and darks. In the next step, after this one, you will get to create a soft transition between values, achieving a sense of realness like the image of the thinking brain. This bold drawing, however, will get you ready for that more advanced, subtler drawing. Use white shapes to indicate the lightest value; shapes with parallel lines for middle value; shapes all blacked in for dark value.

Turn off the artificial lights in the room. If possible, put your object by the window where it gets direct, natural light from one source. Squint. Try to see where your object is highlighted, where it is middle value and where it is dark. Squinting eliminates extraneous details, allowing you to focus on values.



"The Thinking Brain," from BRAIN, MIND AND BEHAVIOR, by Bloom, Lazerson, and Hofstadter; Copyright © 1985 by Educational Broadcasting Corporation; Reprinted with permission of W.H. Freeman and Company. All rights reserved.

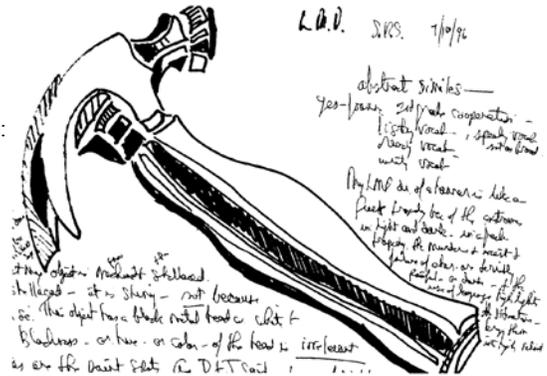
See how lights and darks in our trademark make the brain look real.



Contour drawing with values fitted in: INCORRECT



CORRECT: The three values are drawn as seen, isolated from each other, yet related in space.



Contour drawing of a hammer with lights and values fitted in. Mark this “incorrect.” This approach is incorrect because the exercise involves isolating and drawing only the shapes of the lights, middle and dark values, not the outline of the object.

LMD hammer created by drawing the shapes of the light, medium and dark areas. Correct approach to the LMD drawing.

Draw the actual shapes of the light areas, then the actual shapes of the middle value areas, then the actual shapes of the dark areas. Do not draw an outline of the object and “fit” the shapes in. Lights first, middle values second, darks third. Objects are more complicated than that in most cases, but we’ll just use three values.

LMD #2 SRS. 7/9/97

My LMD drawing tells me that my object is highly light, reflective — it is but it is not shiny. In fact, I see that the leather patch should have been the shiniest because it is a much more light-reflective material than the patterned — or woven canvas. The faces are about as matte as the canvas. The little white lozenges in the joints simply take on the value of the local canvas — or — not really —

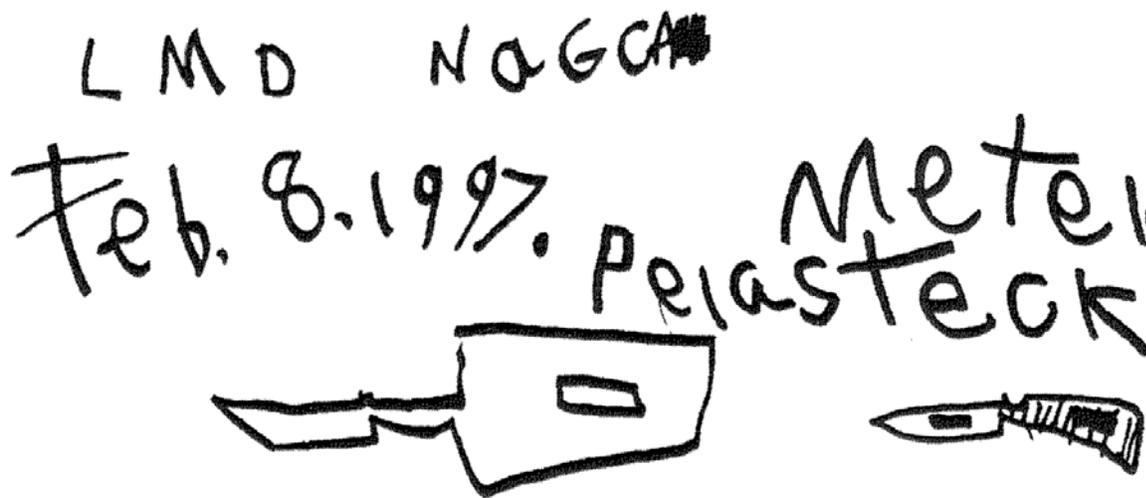
My LMD looks like an angry, mad kid peeks from under his crown, which has slipped low over his brow — which has made him slid down into the corner of his glasses in wonderland or no.

My LMD is an anxious wild duck back and forth, like a lotter, which a terrified, dark-fied face peers out at us — a class in a story — or the bed requires a reader?



LMD, Lacrosse Glove, SRS 97

Why do the LMD drawing? For one thing, LMD drawings look real. We love to produce real-looking drawings. For another, a value drawing is good training in distinguishing the obvious from the less obvious; the dramatic themes from the subtle nuances in a painting, a story, a piece of music or an everyday problem.



LMD drawing. Nate Gorlin © 1997, with word "Pelasteck". Permission of Nate Gorlin.

Think about why light behaves as it does on your object. Does the texture of the object influence light? The age of the object? The materials it is made of?

Write: "My LMD drawing tells me that my object is _____
because _____

Write a simile: "My LMD drawing is like a _____
because _____

Write a metaphor "My LMD drawing is a _____
because _____



Peer Share with your child. Let your child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

Take your Field Notes.

A large, empty rectangular box with a thin black border, intended for students to write their field notes. It occupies most of the page's vertical space.

Lesson Plan IV Step Four

THE "PERFECT" WHOLE



7/19/97
My "Perfect" whole drawing tells me that my
direct to my hand. The webbing, a combination
of foam - soft & stiff - leather areas, side & back
of webbing plus the cotton of the laces with their
plastic tips plus the metal eyelets. My P.W.
draws tells me that my object is curled, tapered,
rounded, big and fat. It looks like fingers pinching a
big fat sandwich. The big like structures on the top
of the flat of the hand is very pronounced - the glove curves
around, twists, turns, straps - a. Sensuous. P.W. &

"Perfect" Whole drawing, lacrosse
glove, SRS

1. Take another piece of paper.
2. **Change to pencils.** *How are pencils different from markers? Do you think differently about pencils, now?*
3. Put your name and the date on the paper.
4. Title it "The "Perfect" Whole.

Why did I call this drawing The "Perfect" Whole and why did I put quotation marks around the word "perfect?" The quotation marks tell us something ironic is going on. We know this drawing is not going to be perfect because no drawing can be perfect. But a drawing can be complete. It can include everything it needs to fully describe the object. It can be whole, or complete, or perfect, in that sense, from the point of view of the person who is drawing.

You are going to draw for as long as you can - at least 20 minutes. Think about the contour of your object, its basic shapes, its lights and darks. Think about all of its little imperfections and details. Try to capture everything, along with the way you feel about your object. You may decide not to draw the whole object, but to

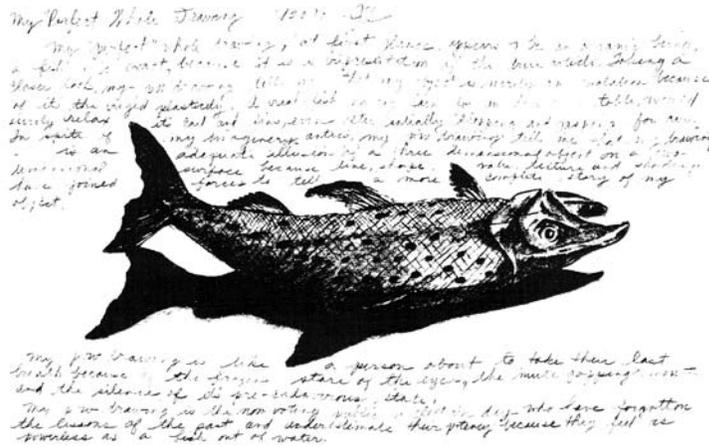
focus on just part of your object for the "whole" drawing. I could just have drawn one finger of the lacrosse glove.

If you want to draw the entire object, do it. If you want to select a part and develop that part fully, then do that.

Patterns for practice: a multi-sensory set of writing exercises

Take a new sheet of paper. You are going to do some writing exercises called Patterns for Practice. Remember why we use the word "because"!

Write five **concrete** sensory similes: *A concrete simile compares the object to something you can touch, like a shell, a rock, a banana.*



The "Perfect" Whole, Joanne Krawczyk, "Fish", Continuing Education, Westfield State College, 1996



My object looks like _____
because _____



My object smells like _____
because _____



My object feels like _____
because _____



My object tastes like _____
because _____



My object sounds like _____
because _____

Write five **abstract** sensory similes. *An abstract simile compares the object to something you can not touch, an intangible item like courage, fear, happiness, terrorism, patriotism.*



My object looks like _____
because _____



My object smells like _____
because _____



My object feels like _____
because _____

Saving Literacy



My object tastes like _____
because _____



My object sounds like _____
because _____

Now, negate your best simile:



“My object does not smell like _____
because _____

Observe how shooting down your own best simile forces you to be more precise, more clear.

Write one **concrete** metaphor.

My object is _____
because _____

Write one **abstract** metaphor

My object is _____
because _____

Now, **negate** your **concrete** metaphor:

My object is not _____
because _____

Negate your **abstract** metaphor;

My object is not _____
because _____

Do you notice anything about your thinking? Negating your best simile, your best metaphor forces you to figure out **even better ones!**

Now, write an analogy. Example: *As the claw is to my hammer, so the hooked section is to the can opener because the curving claw of the hammer and the hook of the opener both exert pressure which remove things like nails or bottle caps.*

Now write a speculation using "might" or "could":

My object might _____
because _____

My object could _____

because _____

Write a prediction:

My object will _____
because _____

Write an hypothesis:

If my object _____ then _____
because _____

Negate any of these constructions and see what happens.

Change any of these constructions from concrete to abstract. See what happens. Why do you think the human brain invented similes, metaphors, predictions, speculations, analogies, and hypotheses?

Why do you think the human brain invented drawing and writing and mathematics and musical notation? The human brain requires meaning and thrives on novelty!



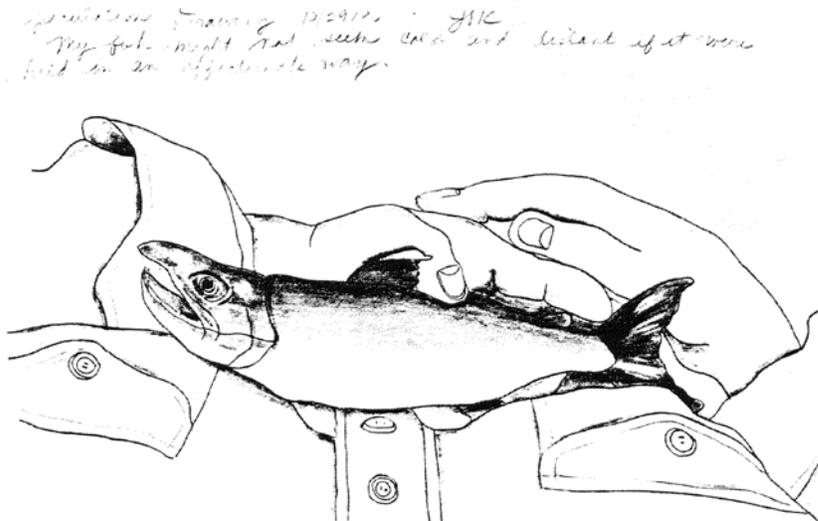
Peer Share with your child. Let your child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

Speculation

Speculation Drawing 10/29/96 J.K. "My fish might not seem cold and distant if it were held in an affectionate way."



Speculation Drawing, Joanne Krawczyk, "Fish",
Continuing Education, Westfield State College, 1996

Take your field notes:

What a Caregiver Can Do to Help!



Listen carefully. Hear the simile, the metaphor, the prediction, the hypothesis. Remark on it. Ask the child what this verbal construction lets him do. Appreciate the new ways of combining images and words. But don't badger, don't pry. Again, the gentle, exploratory approach is suggested: "Ahhhh, aha, I see..." Still, you can provide the words that describe the grammatical constructions.

"Ah, I hear a simile. You've used the word 'like.' You said, 'My drawing of a cat is like a lion.' Why is your drawing of a cat like a lion? I'd love to know." Wait and listen.

Once the child knows it has made a simile or a metaphor (the cat is a lion), the child is more likely to continue to make such comparisons. The child's pleasure at your support and the fun of comparisons themselves encourage the brain of the child, whose positive brain chemicals for the feel of a rewarding experience are streaming in.



Parker Phillips Allen, © permission of Nikki Allen

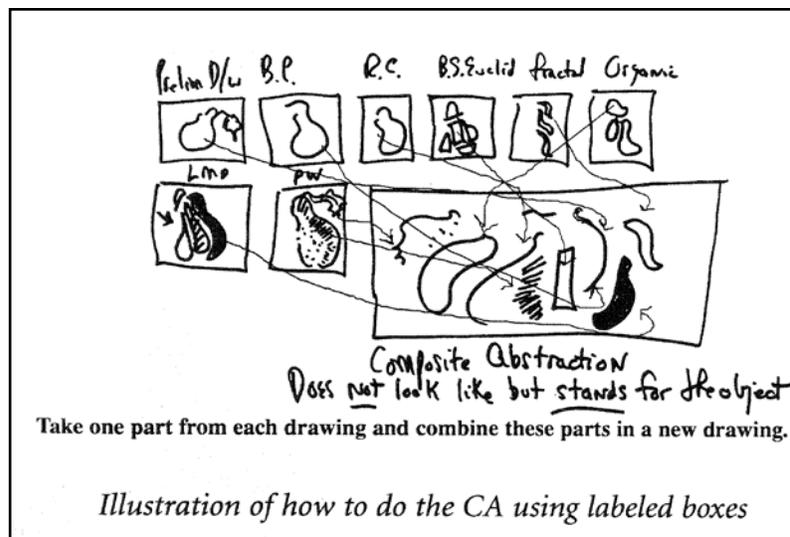
Lesson Plan V

Step Five

THE COMPOSITE ABSTRACTION

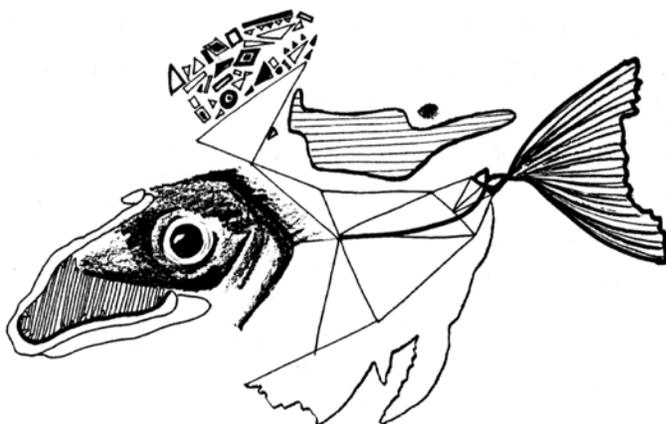
The Composite Abstraction Number One

Now you are ready for the final step of the Drawing/Writing program, the cognitive kicker! It is the drawing exercise which allows the child to construct her first symbol. The drawing no longer depicts the object. The drawing does not write the word for the object, because the child is not yet writing. But, while not looking anything like it, the drawing stands for the object, just as a word stands for an object and, with time, becomes the object for the child who can read.



"Co" means "together." "Pono" means "to put." "Ab" means "away from." "Traho" means "to drag." A Composite Abstraction "drags away" and "puts together".

Take one bit from each of your drawings and put these bits together in a new drawing which does not look like your object but which stands for the object. This drawing is called the



CA#1, Joanne Krawczyk, *Fish*, Continuing Education, Westfield State College, 1996. The original object was a plastic fish.

Saving Literacy

“Composite Abstraction.” (CA) Use pencil or marker or pens. Anything you choose. You’ve earned it.

Say you were drawing a pear. The illustration on the previous page shows you how to do a composite abstraction of a pear after going through all of the steps of Drawing/Writing.

The CA is a drawing that drags certain elements away from a series of drawings - that is, from your Preliminary Drawing, your Blind Contour, Regular Contour, all 3 Basic Shapes Drawings, your LMD drawing, and your "Perfect" Whole and puts them together again in a new way. The drawing is “abstract.” It does not look like a pear or a hammer. Still, it stands for a pear or a hammer. Like a word or an equation or a musical score, the CA stands for the thing.

The child who can’t read words yet can still read his CA drawing. The child who draws a CA has invented her own abstract symbol system. The child who has created a sign to represent meaning is writing and reading. This is hugely powerful. In my 1997 workbook for teachers, *Drawing/Writing and the New Literacy*, I called these CA's "the new hieroglyphics."

The reason for doing the CA? We do the CA with children so that they can teach themselves to read and write by creating their own symbols, first, before they move on to anyone else’s. By connecting drawing with writing and by starting with children’s self-constructed abstract symbols, we may prevent or remediate some learning disabilities before they even start.

In addition, the CA lets children practice inventive or recombinant thinking, seeing what happens when they take something apart and put it back together in a new way.

The CA also opens discussions on ethical behavior and tolerance in the following manner. By asking children to analyze their abstract drawings for "too much," and "too little" in terms of how they have organized marks on the paper, children start to think about right relationships in drawings. This thinking is personal. What feels right to the child is right for the child at that point in his or her development. Over time, with repeated work, the child will learn to refine drawings so that they are balanced, or “work” for the child. We learn to relate to other humans beings in the same way, over time. We learn what is "too much" or "too little" in human behavior. We learn what works.

We can also introduce the idea of acceptable differences with the CA drawing. One child’s CA of a shell will be very different from another child’s CA of a shell. But each child followed the rules of the program. Both drawings are equally acceptable.

Once children know about right relationships and acceptable differences in drawings, they can start to talk about right relationships and acceptable differences in connection with human beings. You will understand these two ideas better, too, when you go on to CA#2. For a more complete discussion, see the 1997 workbook, *Drawing/Writing and the New Literacy*.

Write: “My CA tells me _____
because_____

You do not need to write about the object anymore. Just write about this abstract drawing. See where it takes you.

Now try what I call a "referential" piece of writing about your CA.

Write: "This writing about the CA refers back to my object_____ because_____

See where that takes you. Now, do your simile and metaphor, as usual.

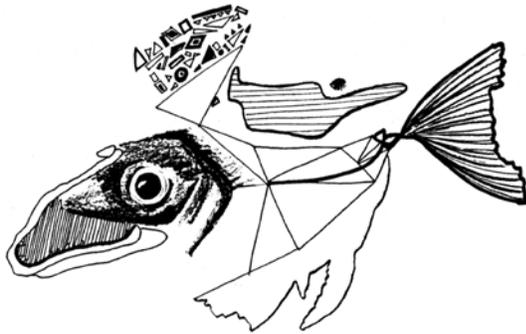
Simile: "My CA is like a _____ because_____

Metaphor: "My CA is a _____ because_____

Take your Field Notes.

The Composite Abstraction Number Two

Look at Joanne's CA#1 below. Can you see in CA#2 what she has taken away (the "too much") and what she has added (where there was "too little")?



CA#1, Joanne Krawczyk, Fish, Continuing Education, Westfield State College, 1996. The original object was a plastic fish.



CA#2, Joanne Krawczyk, Fish, Continuing Education, Westfield State College, © 1996

How to do CA #2:

When a drawing has everything it requires to describe, say, a pear, it is complete. It is complete, that is, from the point of view of the one who draws it. It has neither too much, nor too little. Using this simple rule, "neither too much nor too little," makes it easy for a child to judge a drawing.

Hold up your child's CA #1 drawing. Ask your child to nod when he has decided where there is "too much" and where there is "too little" in the drawing. Rotate it slowly until your child nods. When the child nods, he indicates, without words, that he knows what to do with his drawing; he knows when there is "too much" and "too little." He can take from the drawing or add to the drawing.

Have your child do the same for you with your CA#1.

You and your child will take another sheet of paper and markers and do a new drawing from CA#1. Do not go back to your original stack of drawings. Stay with CA#1. You and your child are refining your end product to produce a better end product.

You and your child can add one new item, but otherwise you will both be rearranging CA#1, eliminating some items, changing sizes of other items, changing relationships between items, for instance, by overlapping them.

Write:

My CA#2 tells me _____

because _____

Simile: My CA#2 is like _____

because _____

Metaphor: "My CA#2 is _____

because _____

Why do the CA#2? By thinking about "too much" and "too little," the child discovers ideas about right relationships and acceptable differences and can begin to talk about them in other ways, for instance, in terms of family relationships. That is, a mother might be hovering "too much" over a child!

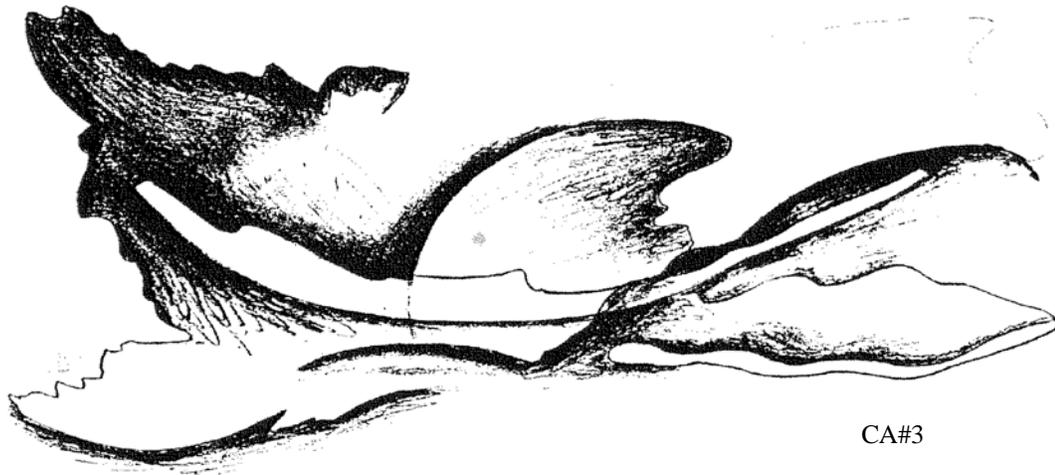


Peer Share with your child. Let your child go first.



Build vocabulary by choosing two words the child used or wrote and put them on a list. Ask the child to do the same, choosing from your words. If the child is old enough, have them write those two words on her list. If the child is not, model this vocabulary-building strategy for her. Ask the child the meaning of each word you chose from her talking or her writing. Add these words to your list. Do the same with your own explanations of your own words. If necessary, resort to the dictionary and add those words, too.

If you choose, you could do a CA#3. What do you think of Joanne's CA#3? What does it say about fish?



CA#3

Composite Abstract III 11/3/96 JSK

Joanne Krawczyk, Fish, Continuing Education, Westfield State College, 1996.

Saving Literacy

Take your Field Notes.

A large, empty rectangular box with a thin black border, intended for the user to write their field notes. The box occupies most of the page's vertical space.

CLOSING DRAWING AND WRITING



dreamstime.com, photo ©Heidi Tuller

How to evaluate changes in drawing and writing

1. Take a piece of paper.
2. Write your name and the date on it.
3. Take a new object.
4. Use any drawing tool you want to: pencil, pen, markers, crayons - one or all of them!
5. Draw the new object for five minutes and write about it for five minutes.



Peer Share with your child. Let your child go first.

Compare your child's *first* Preliminary Drawing and Writing with your child's *last*, or Closing Drawing and Writing in the following way:

Quick Evaluation: Drawing

Look at the child's Preliminary Drawing and the child's Closing Drawing. Has the drawing become more complex? More realistic? Larger? Stronger in lights and darks? In value? By any chance has the drawing become simpler? If the drawing is simpler, what do you think is going on?

Ask the child to talk about his Preliminary Drawing and Closing Drawings. Now, do the same for your own Preliminary Drawing and Closing Drawings.

How would you and the child describe the changes in the child's drawing?

because _____

How would you and the child describe the changes in your drawing?

because _____



Peer share these results with your child. Let your child go first.

Saving Literacy

Quick Evaluation: Writing

Remember we will count a child's words if they are making "writing" kinds of marks, including wavy lines or invented spelling or words spoken by the child which you wrote down as dictation.

- Start by counting words.

How many words are in in the child's Preliminary Writing?_____ How many in yours?_____

How many words are in the child's Closing Writing? _____ How many in yours?_____

Did the child write (or in the case of the preliterate child, speak) more or less words? What do you think talking or writing more or less words means?

Count similes.

Number in Preliminary Writing? The child's writing_____ Your writing_____

Number in Closing Writing? The child's writing_____ Your writing_____

Count metaphors.

Number in Preliminary Writing? The child's writing_____ Your writing_____

Number in Closing Writing? The child's writing_____ Your writing_____

Count speculations (Sentences that use "might," "could").

Number in Preliminary Writing? The child's writing_____ Your writing_____

Number in Closing Writing? The child's writing_____ Your writing_____

Count predictions (Sentences that use "will").

Number in Preliminary Writing? The child's writing_____ Your writing_____

Number in Closing Writing? The child's writing_____ Your writing_____

Count analogies. (As A is to B, so C is to D.)

Number in Preliminary Writing? The child's writing_____ Your writing_____

Number in Closing Writing? The child's writing_____ Your writing_____

Count hypotheses. (You need to use the formal "If... then..." construction to qualify as an hypothesis.)

Number in Preliminary Writing? The child's writing_____ Your writing_____

Number in Closing Writing? The child's writing_____ Your writing_____

Remember that you need to use the formal construction "As A is to B, so B is to C" to qualify as an analogy.

Now, how would you describe the overall changes in the child's writing and in your writing?

The child's writing has changed _____
because _____

Now, do a Quick Evaluation of your own writing as conducted above with the child's writing.

My writing has changed _____
because _____



Nate, 6 years old, drawing his family for entry into 1st grade.

Closing Benchmarks for Mark-making, Attention, Mood and Behavior

Now let's evaluate the child again for behavior, attention, mood and emotion, curiosity, playfulness. We will be looking at the following categories for changes in mood as well as in mark-making skills:

Evaluating the child's level of attentiveness to marks:

- Length of time the child will engage in scribbling? _____
- In drawing? _____
- In pre-writing? _____
- In writing? _____
- In reading? _____

Evaluating the child's level of attentiveness to marks:

- Length of time the child will engage in scribbling? _____
- In drawing? _____
- In pre-writing? _____
- In writing? _____
- In reading? _____

Saving Literacy

- Using Kellogg's examples in this book, comment on the range of the child's scribbles? 1-10? _____
Comment on the range of the child's drawings? 1-10? Describe the range of invented spelling or use of the alphabet?
List letters and words _____

- Describe the range of the use of numbers? List numbers _____
- What is the child's physical activity level? Scale of 1-10 _____.
- What is the child's talkativeness level? Scale 1-10 _____.
- What is the child's level of alertness, attentiveness? Scale of 1-10 _____.
- What is the child's cheerfulness level? Scale of 1-10 _____.
- What is the child's core characteristic? Shy, outgoing; happy, sad, angry/ irritable, calm/peaceful, withdrawn, curious? _____
- What is the child's level of playfulness? Scale of 1-10 _____.
- What is the child's level of curiosity, adventuresomeness? Scale of 1-10 ____.
- What is the child's physical activity level? Scale of 1-10 _____.
- What is the child's talkativeness level? Scale 1-10 _____.
- What is the child's level of alertness, attentiveness? Scale of 1-10 _____.
- What is the child's cheerfulness level? Scale of 1-10 _____.
- What is the child's core characteristic? Shy, outgoing, happy, sad, angry/ irritable, calm/peaceful, withdrawn, curious? _____
- What is the child's level of playfulness? Scale of 1-10 _____.
- What is the child's level of curiosity, adventuresomeness? Scale of 1-10 ____.

Quick Evaluation: Compare these benchmarks with Beginning Benchmarks on page 154. Has the child's ability to pay attention, control mood, show curiosity and be playful changed? Does the child speak more? Does the child draw more?

Take your Field Notes.

How Caregivers and children feel now about mark-making after the scribbling exercises and the Five Drawing/Writing Lesson Plans.

Scribble for two minutes. Write about how it feels to scribble:



Scribbling feels like _____
because _____

What you think scribbling is:
Scribbling is _____
because _____

What your scribbles mean to you, or tell you:
My scribbles tell me _____
because _____

Draw for two minutes. Write about:



How it feels to draw:
Drawing feels like _____
because _____

What you think drawing is:
Drawing is _____
because _____

What your drawing means to you, or tells you:
My drawing tells me _____
because _____

Write for two minutes. Write about:



How it feels to write:
Writing feels like _____
because _____

What you think writing is:
Writing is _____
because _____

What your writing means to you, or tells you:
My writing tells me _____
because _____



Photo by ©Konstantin Pigrov

Do some math for two minutes:



How it feels to do math:

Math feels like _____

because _____

What you think math is:

Math is _____

because _____

What does math mean to you, or tell you:

Math tells me _____

because _____

Do some musical notation for two minutes.



How it feels to write music:

Music feels like _____

because _____

What you think music is: _____

Music is _____

because _____

What does music mean to you, or tell you: _____

Music tells me _____

because _____

Compare these answers with the responses you gave in the Preliminary Scribbling, Drawing and Writing exercises on page 154.

My two pieces of writing about writing are alike because _____

My two pieces of writing about writing are different because _____

My two pieces of writing about drawing are alike because _____

My two pieces of writing about drawing are different because _____

Make sure to include the word “because” in each statement. Using the word “because” forces us to explain our statements to ourselves, encouraging more analyses, tighter logic and clearer explanations. "Because" teaches the brain to press on in the search for meaning.

Look at exercise three in warm-up exercises "Getting Ready: Warm-Up Exercises for Caregivers" on page 145. Read over those plans for changes in your caregiving life.

Would you modify any of those plans, now, after completing the Scribbling/
Drawing/Writing program?

I would modify my earlier plans _____
because _____

Don't forget to use the word "because"!

Look over your field notes.

Will your field notes influence your plans for your caregiving program? _____

How? _____

because _____

Why? _____

because _____

Take your Field Notes.

***Suggestions for Activities after Completing the Scribbling/Drawing/
Writing Program:***

- Look over your child's scribbles and drawings. Put them up for a mini-art show. ***Let your child talk about his work, his progress, where he thinks he is going as a visual meaning maker.*** Do the same mini-art show for yourself. Present your work to your child. Tell the child where ***you*** think ***you*** are going as a visual meaning maker.
- Read over your field notes, again. Evaluate your child's progress and your own progress as visual thinkers, as emotional thinkers, and as verbal thinkers.
- Look at changes in the child's emotional and behavior Benchmarks. Do you detect danger signs or normal development or extraordinary development?
- Look at changes in your professional caregiving style using this program. Describe what you see happening as a professional caregiver, emotionally, visually, and verbally.
- Look at changes in your personal attitudes about your life using this program.
- Describe what you see happening in your life, now, emotionally, visually and verbally after using this program.

Translating Across More Than Two Sign Systems: How it Feels, What it Looks Like


 A black rectangular box containing the text "T2S Plus" in a white, bold, serif font.

You and your child have just achieved a cross-modal translation exchange between two systems of representation - drawing and writing. Wow! Yes, you have! You have moved information from one side of your brain, from the visual side (using drawing), over to the verbal side of your brain (using writing). In the process, you have extended and transformed meaning. Your writing was very different from your drawing, wasn't it? It did not look like your drawing and it did not mean exactly what your drawing did.

Because the human brain has invented other marks to communicate -- mathematical meaning, musical meaning -- it makes sense to work with these sign systems, too and to practice translating across them.

Research is showing us that little children think mathematically. Even ducks can count how many duck hunters go into a duck blind. That's because they need to know how many hunters come out before it is safe for them to land on the pond. Children do more than count. They can talk about and make marks about numbers, distance, time, motion, relationships, space, shapes. Migrating birds accomplish incredible feats with time and distance, but they do not discuss it, nor represent such feats using marks.

This book makes a strong empirical argument for using geometry, not words, as children's first visual, marks-based language. Children's second natural marks-based visual language is drawing, both conceptual and representational. When children are very young, their bodies and their brains are integrated. Their hands translate exactly what their brains are thinking using marks on paper. This book is about trying to read these marks on neurobiological, and on physical, emotional, and mental levels, applying that information to parenting and caregiving practice.

If we interact with children, concentrating on mark-making, moving from scribbles into geometric shapes (with talk about geometric shapes), and then into drawing (with talk about drawing), and then into algebraic notation with talk about algebra, musical notation with talk about music, and then, by working with the alphabet and invented spelling into writing words with talk about writing, what would happen? We might discover a natural progression into multiple literacies. If this discovery should occur, then wise parents, and other caregivers, including teachers, will make a point of including mark-making as a developmental progression at home, and in preschool programs, and in elementary education.

I Propose that the Developmental Mark-making Trajectory for Children Will Look Something Like This:

Scribbling to Invented Geometry to Formal Geometry to Drawing to Invented Algebra to Algebra, Invented Musical Notation to Formal Musical Notation, to Invented Spelling to Formal Spelling. While development may progress in certain consistent ways, none of the systems of mark-making ever becomes obsolete because of the tremendous conservatism of the human

brain. It never throws out its inventions. It builds on them instead. We can be writers one day and painters the next and then musicians and mathematicians on simple every day levels!

An Argument for Algebra with Very Young Children

In this book, note the introduction of algebra before the introduction of words in the developmental progression of marks. If we refer in "Stories" to the one about Sam (page 45) we see how young the child is when he/she invents simile and metaphor using analogical thinking. An analogy and a simile and a metaphor spring from sameness and difference. In a simile and a metaphor, and in an analogy and, thus in an algebraic statement, comparisons are complicit/ implied/understood.

In Sam's term "zebra trees," the implied analogy might go like this: As the skin is to a zebra, so the bark is to the birch tree. It's understood that the visual pattern of black and white is what allows the analogy to be made between skin and bark in the term "zebra trees."

As implicit as the analogy in Sam's "zebra trees" is the algebraic intuition on which that analogy rests. That algebraic statement might go like this:

Let **S** stand for striped
Let **T** stand for trees
Let **B** stand for birch trees

Then: **S+T=B**
 or **S•T = B**
 or **T^S=B**

This algebraic statement requires that the child learn the arithmetic operations of plus (+), minus (-), times (x) and divided by (÷) and also to the power of (**T^S**), or "tree to the power of striped." These operations are intuitively accessible to the child and, I believe, will be obvious and of formal use by age 6 - probably by age 4. The algebraic statements above are hugely powerful, all purpose, very short and do not require writing words - just letters and mathematical operations.

Let's see how an introduction to algebra might be done. Let's use making applesauce as our algebra activity.

Making Applesauce

Let **A** = apples
Let **B** = sugar
Let **C** = applesauce

Then: **A + B = C.**

If the child asks, "What about heat?" then you could ask the child how to indicate heat and the child might add:

Let **H** = heat. Then, she might ask, "How hot?" and you would have to talk about degrees.

So $H=220$ degrees, but a careful 220 degrees to allow boiling but not burning the applesauce.

The child would have to invent an algebraic statement to indicate the relationship of heat to sugar and apples. Being already conditioned by formal algebra, I might write:

$$C = H(A + B)$$

If the child wants to specify boiling time, then she might add something like $T = \text{one hour}$, and so forth.

So, then, $C=H \times T(A+B)$ or something like that to describe making applesauce algebraically. I am an amateur at algebra. But I can try it!

It does not make any difference whether you really know, as a professional caregiver, how to do algebra in any sophisticated way or not. We can all make algebraic statements like the ones above using letters of the alphabet, the symbols for mathematical operations (add +, subtract -, multiply \times and divide \div), plus parentheses and "power-to," for instance, $a(x)^2$. If you and the child can deconstruct and reconstruct an activity like making applesauce and represent that activity in some way (including pre-verbally, using pictures, or any other kinds of marks if the child is not forming numbers or letters yet), then you and the child will have been successful as mark-makers and as thinkers! You and the child can INVENT algebra together.

If you play around with algebra together, the child may grow up using algebra as one of his or her everyday problem-solving languages. Algebra won't be an intimidating external system of thought, but a natural, personal process for thinking and reasoning. One thing is sure, you'll be practicing procedures for making things and this kind of learning -- called procedural -- or how to do something -- step by step -- is useful and powerful training for the brain in terms of successful problem-solving skills. (Seymour Papert, *Mind Storms*, 1980. Basic Books:New York. This is an excellent book about procedural computer learning and "turtle" geometry for older children.)

EXERCISES IN TRANSLATING ACROSS SYSTEMS OF REPRESENTATION

Take your CA#2. Look over the drawing and the writing.

1. Translate the drawing into an algebraic statement.

Music

An Argument for Introducing Musical Notation with Very Young Children.

Children love music. We know this by watching them respond to music. We remember dramatic fetal responses when we went to concerts. Little children bounce, hop and dance to music in the womb and outside of it.

Saving Literacy

You don't have to be a musician to teach yourself and your children musical notation. Notes that are held longer are bigger. For instance a whole note is bigger than an eighth note. A note that is higher in pitch is written higher up on the paper. It's obvious in a spatial kind of way.

Get a beginner's book on music. Teach yourself the shapes of the notes and the sharps and flats. Write some music on a piece of paper. Make a pretty design. Get a friend who knows how to play the piano to play your musical "design". Or find a piece of music software and write your line of music and then ask the machine to play it as "orchestra" or as "chorus." You will be amazed and delighted with yourself.

Think about how your child is going to feel when you two do this musical notation together creating marks that will be heard. Fantastic! What a preparation for grapheme to phoneme correspondence (which is a fancy way for saying how the *look* of a word provides visual clues to how it should *sound*).

Let's start with a *simple round*.

The Round: How to translate from the visual to the musical.

Here are the basic musical notes and their values and how to place them in space. We are working with four/four time, that's four beats to a measure.



Stands for 4 beats. This is the shape of one whole note. There is one whole note to a measure in 4/4 time



Stands for 2 beats, therefore, two half notes to a measure



Stands for 1 beat, therefore, four quarter notes to a measure



Stands for 1/2 beat, therefore, 8 eighth notes to a measure. Note that an eighth note has two tails.

"Row, Row, Row Your Boat" is a musical **round**. The same musical notes in the same order at the same pitch are repeated over and over, with a new voice coming in after the words "Row, row, row your boat" are completed. When the song is completed by any one voice, that voice just begins again, so that the **round** goes "round and round," potentially forever. The notes repeat and the words repeat.

Note that there are four lines in the stanza and, essentially, two voices.

A **round** is a simple kind of **canon**. In a **canon**, two or more voices or instruments play the same music also starting at different times. A second voice can come in one measure after the first voice (as our drawing on the next page shows, where four drawings make up one measure, or the measure of weather), or it can come in after less time.

In a **canon**, the second voice can also come in at a different pitch. The canon can start on C and the next voice can start on F above this, for a "canon at the fourth," or four notes above in

pitch. It can also start below or at a slower speed. In a strict canon, each voice imitates the other exactly. Thus, a strict canon is a round.

Row, Row, Row Your Boat

Row, row, row your boat,

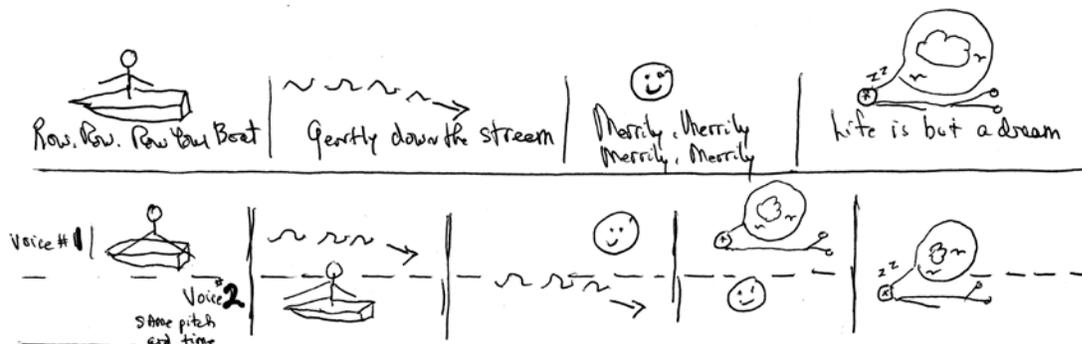
Gent - ly down the stream,

Mer - ri - ly, mer - ri - ly, mer - ri - ly, mer - ri - ly,

Life is but a dream.

How to write a visual fugue and turn it into a musical fugue.

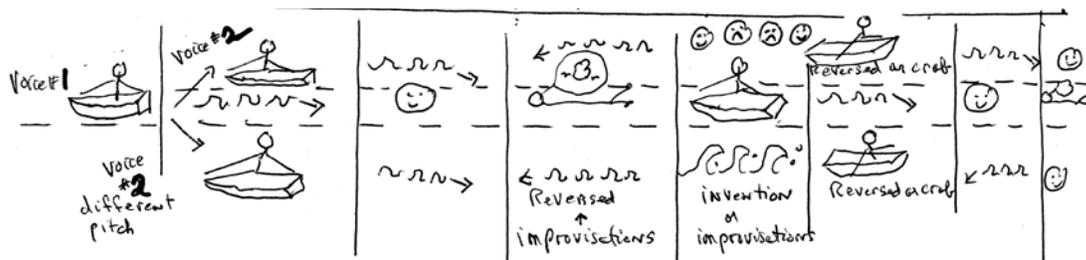
Visual Translation of the lyrics to the simple round, "Row, Row, Row, Your Boat"



Visual Translation of the lyrics, "Row, Row, Row, Your Boat" as a canon.



Visual Translation of the lyrics, "Row, Row, Row, Your Boat" as a fugue.



A *fugue* is a *canon*. The word fugue comes from the Latin verb "fugo, fugare," to "flee," "chase." A fugue, like a canon, chases itself. It opens with a main theme, or subject, which then is sounded by each voice successively in imitation. Then, a series of inventions on the main theme may follow, including reversing the theme. There are rules for the pitch at which each new voice with its embroideries on the main theme, or a subject, come in. There may be many countersubjects, or embroideries (free counterpoint, exposition, closing material, or coda). Let's try drawing a round, and writing one. Let's try drawing a canon, and writing one. Let's try drawing a fugue and writing one. Refer to the diagrams above and on page 210 for ideas. As you look carefully at page 210 you will see the rules for writing a fugue, drawn as pictures and written in words (Rules for Writing a Musical Fugue).

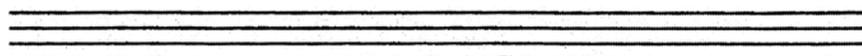
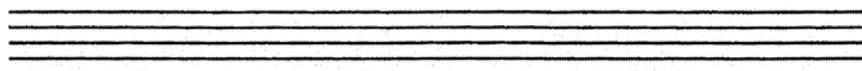
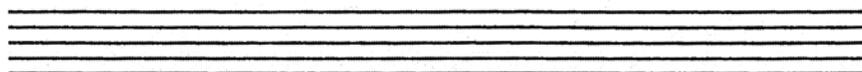
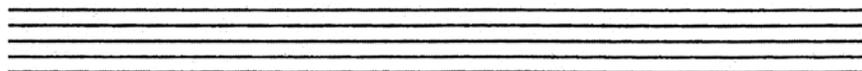
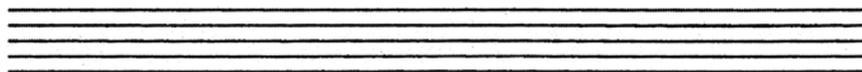
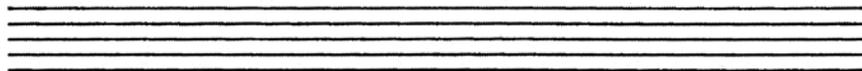
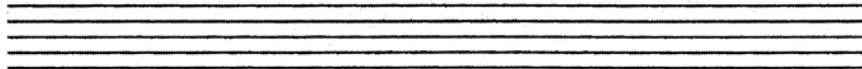
A fugue is recursive; it “runs back” to it’s main theme. A fugue is a fractal, depending upon a “seed”, or musical statement for it’s construction. The “seed” reappears over and over. A fugue is like DNA which uses a small number of proteins woven into a double helix to create the fantastic elaboration and improvisation of the body and mind of the child. A fugue is a metaphor and a model for life.

Drawing of your round.

Drawing of your canon.

Drawing of your fugue.

Write your musical round, canon, and fugue below. See how they can build on each other, starting with one very simple theme.



Saving Literacy

Here is an attempt to create a series of translations across systems of representation, from a visual fugue, to a musical fugue, to a verbal fugue, to an algebraic translation, to a drawing in response to listening to your own music.

a. Visual fugue
 dr. musical fugue
 c. Verbal fugue/translation
 d. algebraic translation
 e. drawing in response to hearing the music

a. Counter Theme

b. Theme

c. I love ^{sun} rain, clouds, lightning I love ^{sun} rain, clouds + lightning Descend instead of ascend

d. algebraic statement/translation
 $a + 2b + 4c = 8d$
 $a + 2b + 4c = 8d$

Counter Theme
 The sun dispels rain, cloud + light; Lightning slashes clouds, rain hides the sun
 $a(2b) - 4c = 8d$
 $8d/4c = 2b/a$
 or $8d/4c = 2b$

e. Drawing in response to music - hearing it.

Rules for Writing a Musical Fugue

You might use your canon as your first voice or subject. This voice will sound over and over again, in slightly or greatly changed ways, called expositions or variations. If the exposition sounds like the first voice, it is called a counter-subject. If it is new material, heard only once, it is called free counterpoint. Each voice responds to its own subject or answer in turn, generating more countersubjects and free counterpoints.

Look at my drawing. I have only drawn/written the first four stanzas of a possible fugue. My subject is SUN, RAIN, CLOUDS, LIGHTNING. Under each picture is a set of notes. When I bring my second voice in, I bring it in above or below the repeat of SUN, RAIN, CLOUDS, LIGHTNING. Then, at the third stanza, or repeat of SUN, RAIN, CLOUDS, LIGHTNING, I bring in my third voice as a crab canon, reversing the order of the images: LIGHTNING, CLOUDS, RAIN, SUN, and thus, reversing the musical passages that go with them. I conclude with the original canon bracketed, as it were, above and below, by the crab canon.

As we have already noted, the term fugue comes from the Latin verb, "fugo, fugare", meaning both "to flee" or "to chase after." In a fugue, one voice runs from or runs after another voice, depending upon how you look at it. The fugal relationship is intimate and developmental. It moves forward, builds, resolves in sensitive inter-responsiveness, just like a conversation between people, or like the dialogue between the artist or writer, musician or scientist with his or her material.

The fugue is a call-and-response musical form. The first voice calls and the second voice answers. The answer influences the next response, and so forth. As such, this musical form recaptures and manifests the attentive, communicative mother/child dyad which is of such critical importance in early childhood. For that reason, writing a fugue is good training in the art of musical conversation, providing practice with a model for the give and take of a successful exchange of meaning.

A six-part fugue would have five new voices enter the piece. If you bring in the first voice with its theme written backwards, you have written a crab canon into your fugue:

This is all that I understand about how to write a very simple fugue:

- 1) Write your first voice or subject, perhaps using your canon. Repeat this again and again across the middle section of a sheet of music paper.
- 2) Bring in the second voice, written exactly like your canon but 5 notes above or 4 notes below the pitch of the first note of the second entry of your canonic subject.
- 3) That second voice can come in as a dissonant note; that is, it can be a 2nd, 7th, 9th, 11th, or 13th pitch as it plays against that first note of that second entry of your original canon.
- 4) The dissonance can be resolved on the 1st or 3rd beat in the 3rd or 4th measure of voice #1, which we are writing as the repeated canon. Resolving the dissonance, or creating assonance, is achieved by turning that dissonant note into a 3rd, 5th, or 8th (octave) in relation to the note of the original canon it is playing against on the 1st or 3rd beat of that 3rd or 4th measure.

I hope I have not confused us both.

The other approach is to simply write a theme, bring it in again and again, either over or under the original "voice" in anyway you choose to. Try using an electronic keyboard and SEE/HEAR WHAT HAPPENS. Keep a written record of what you are doing in case you chance upon something fantastic. Your ear will doubtless lead you intuitively down the right path for your very own first fugue.

Exercises in translating across systems of representation

Take your CA#2. Look over the drawing and the writing.

1. Translate the drawing into an algebraic statement.
2. Translate the algebraic statement into a musical statement.

Saving Literacy

3. Get someone to play the musical statement, the whole thing. Listen. Respond. What do the notes of music tell you?
4. Translate the musical statement into writing.
5. Have someone read your writing aloud and do a dance to it.
6. Have someone tape your dancing, Watch the tape and make whatever marks to describe your movement.
7. Reflect on those marks by talking and writing about them. Or use math or more music or a drawing, painting, or sculpture to describe your "CA#2" dance.

Where do we go from Here?



Where?

Children's brains will adapt to existing conditions. Parents and caregivers and teachers can adapt or react, too. If caregivers feel that certain aspects of childhood are being lost which are necessary to a productive and effective life for the child, they can take steps. The simplest steps are those we retrace to the mainstays of old-fashioned parenting: love, time, talk, songs, bedtime stories, books, scribbling, drawing - the activities which teach children to talk, trust, imagine, love, create, believe, speak and be literate.

Teachers, too, will find inspiration in earlier research and practice (Lev Vygotsky, Jean Piaget, A.A. Tomatis, Viktor Lowenfeld, Herbert Read, Maria Montessori, Rudolf Steiner, John Dewey, William James, Rhoda Kellogg, Loris Malaguzzi).

We may be in a transitional period - at the crossroads of evolution and technology.

This book supports a few basics of human development that have been long-term goals of hominid evolution:

- the ability to pay sustained attention
- the ability to connect emotionally with others and to care about what they are thinking and feeling
- the ability to be able to speak and be literate and to take effective, satisfying action in the world for the sake of oneself and others

If these evolutionary outcomes remain important to human evolution, we need to protect and preserve them. We can be computer-literate and still be empathetic. We can read a book or write a book or create a sculpture or a painting or a piece of music (all of which require sustained attention), as well as learn to follow the fast presentation of image and text in “screen thinking”.

The challenge we face is to protect normal fetal and infant and toddler brain development during its early sensory-motor unfolding when systems synchronize and integrate in response to whatever the environment offers in terms of aural, visual, tactile, and olfactory stimuli.

This book and its companion, *HandMade Marks* provide concrete suggestions and exercises designed to nurture early language experience, while protecting children from some potentially damaging experiences.

Useful Information About Technology

TV's, computer monitors, refrigerators operate by electrical signals called **radio waves**. Radio waves operate over a wide range of frequencies. Can radio waves damage immature neural

Saving Literacy

systems? In terms of raster rates in lighted screens, that is, of the refreshing of images, as well as the rate of presentation of information by the actual programs, research suggests that radio waves do cause attentional, emotional, and learning problems.

A young person can hear sound from about 20 to 20,000 Hertz, or volume/loudness. For people around the age of 50, the range of hearing is reduced to 100 to 8,000 Hertz. It is certainly possible that (1) radio waves, or (2) sounds greater than 20 Hz or greater than 20,000 Hz, might cause damage to humans (Steven W. Smith, author of *The Scientist and Engineer's Guide to Digital Signal Processing*, 1997, e-mail correspondence 3/15/08).

Smith writes, "Anything a human can hear is a sound wave between 20 and 20,000 Hertz. This can be broken into two general types, "broad band" and "narrow band." A good example of broad band is "white noise", much like hitting all of the keys on a piano at once. In contrast, narrow band is an individual tone, such as hitting an individual piano key. Static on the radio and rain drops hitting the roof are examples of white noise. Speech and music are mainly narrow band. Devices such as computers, TV's and kitchen appliances generate a combination of the two.

Can exposure to excessive white noise disrupt normal brain development? Research with young rats suggests that excessive white noise does arrest immature rat development.^{43,44} White noise entering the ears evidently causes highly randomized neural firing in the auditory sections of the brain. It's certainly conceivable that excessive white noise could cause problems with the developing brain. On the other hand, it's hard to believe that limited exposure to white noise is harmful, considering that there are many sources of white noise in nature --- rain, rivers, and wind. The irony is that white noise machines, designed to protect adults and children from the onslaught and distraction and interruption of environmental noise, may actually increase the incidence of the intense, 1/f random bursts of noise within the white noise spectrum that may be especially damaging to immature brain systems.^{44A}

It is critical to research the design of toys and child-directed media to determine the actual enrichment advantages or damage-potential to immature brains, especially in connection with hearing and vision.

Useful Information About Sound

Hertz (loudness or volume) and normal brain activity.

- 1 Hertz equals 1 cycle per second, or, in this context, 60 bpm (heartbeats per minute).
- The fetal heart oscillates between 120 and 160 bpm, or between 2 and 3 Hz.
- A newborn's heart beats at about 120 bpm, or 2 Hz.
- A man's heart beats about 72 to 85 bpm, or 1.20 -1.4 Hz
- A woman's resting heart rate is 3-7 beats more than a man's per minute, or 79-92 bpm, or 1.46 Hz.

⁴³Chang, Edward, Merzenich, Michael, "Environmental Noise Retards Auditory Cortical Development," *Science Magazine*, March 2003.

⁴⁴Chang, Edward; Shaowen Bao, Kazuo Imaizumi, Christoph E. Schreiner, and Michael M. Merzenich. 2005. "Development of spectral and temporal response selectivity in the auditory cortex." The National Academy of Sciences. Univ. of CA, San Francisco.

^{44A}Smith, Stephen. Chapter nine, *The Scientist and Engineer's Guide to Digital Signal Processing*, 1997, Technical Publishing Company: San Diego, CA.

- The normal heart rate at rest is, thus, for humans, between 60 and 100 bpm, or 1.00 to 1.67 Hz.
- Babies suck while nursing at between 40-60 times per minute, or at 1 Hz or under.
- A man's normal speaking voice is around 130 Hz, while a woman's is 220 Hz.
- Motherese has an average pitch of 238.5 Hz but may go as high as 600 Hz.⁴⁵ and, as pitch, helps infants learn the vowel categories in their language.^{46,47} It is the rate of the communicative sounds and gestures that attract the infant. As the child moves beyond babbling and first words, the brain tissue is altered for language.⁴⁸
- Motherese occurs at about 4.2 syllables per second⁴⁵ or 15 Hz.
- Babbling, the adult resting heart beat, and nursing rhythms are all about 1 Hz.
- Motherese occurs at 15 times that speed and functions as a speeder-upper/tuner-upper.
- No figures for hertz and scribbling in children exist.

The shared mother/child activity around the mother's speech expressed by the child's gestures, cooing, and babbling is designed to ratchet up the brain of the infant to higher hertz so it can receive and understand normal speech. I believe that scribbling is designed to help consolidate and integrate the neural wave form for speech and then for whatever rate is necessary for the early formation of letters and numbers, or literacy.

Babies who are learning to speak and to make hand gestures operate at about 3 hertz in frequency. Babies exposed to sign language make a second kind of hand gesture at about 1 hertz. Speech-directed babbling occurs at 1 hertz, too. The fact that babies are attracted to such frequencies and create them as they babble supports the idea that tissue in the left hemisphere is not only sensitive to, but produces these frequencies as a pattern, or cue.

If the planum temporale in babies^{49,50} vibrates at 1 hertz and if motherese operates around this frequency, slowly speeding up, to tune the infant brain to the neural frequencies necessary for understanding and producing human speech (just as --- this book theorizes --- scribbles tune the child's brain for the frequencies of literacy), then the brain wave frequencies recorded during child speech and toddler's scribbling should indicate the appropriate environmental hertz levels for pregnant women and young children whose bodies and brains generate and require the "heart beat" of language.⁴⁸

If we want to allow and encourage normal brain development in the fetus and in the young child, we should make sure the environment is operating within normal hertz levels for the fetus, the infant and the toddler in terms of what is heard, felt and seen.

The environment shapes sensory systems. Genetically fragile brains are susceptible to influence from noisy televisions, radios, even air conditioners. An expert in autism urges talking

⁴⁵Fernald, A., & Simon, T. (1984). "Expanded intonation contours in mothers' speech to newborns." *Developmental Psychology*, 20, 104-113.

⁴⁶Kuhl, P. K., Williams, K. A., Lacerda, F., Stevens, K. N., & Lindbloom, B. 1992. "Linguistic experience alters phonetic perception in infants by 6 months of age." *Science*, 255, 606-608.

⁴⁷Kuhl, P. K., Andruski, J. E., Chistovich, I. A., Chistovich, L. A., Kozhevnikova, E. V., Ryskina, V. L., et al. 1997. "Cross-language analysis of phonetic units in language addressed to infants." *Science*, 277, 684-686.

⁴⁸Petitto, L.A. Holowka, S., Sergio, L. & Ostry, D. (06 Sep 2001). "Language rhythms in babies' hand movements." *Nature*, 413, 35-36.

⁴⁹Petitto, L.A., Zatorre, R.J., Gauna, K., Nikelski, E.J., Dostie, D., & Evans, A. C. 2000. "Speech-like cerebral activity in profoundly deaf people while processing signed languages: Implications for the neural basis of all human language." *Proceedings of the National Academy of Sciences*, vol 97, 25, 13961-13966.

⁵⁰Petitto, L. A., 2000. "On the biological foundations of human language." In K. Emmorey and H. Lane (Eds.) *The Signs of Language Revisited: An anthology in honor of Ursula Bellugi and Edward Klima*. Mahwah, N.J.: LEA, pp. 447-471.¹¹ Doidge, 2007, p. 307

and reading to babies and little children "all the time," adding that "singing and structured music" is useful, too. "In general, it is the richness and variety of clear sounds that matters most."^{31,51}

Autism: Induced or Inherited?

Research with young rats proves white noise overloads immature neural systems, causing a premature shutdown in development during the very sensitive time for growth and integration. Once rats are returned to a normal environment, their hearing develops normally because the windows of opportunity for development of that system are still open.⁴³

In humans, a system-wide breakdown for attention, connection and language present at birth or identified in early development around the age of one or two is called autism. (Auto means "solo" or "self" or "on one's own.") Early speech and scribbling often stop together at the onset of autism, as if they were linked (see Terese and Evan in "Stories"). If white noise causes young rats' brains to stop producing the neurotransmitter for normal growth, are there other persistent, pervasive environmental influences that might arrest brain development in very young humans, too?

The range of behavior described as autistic is currently understood to have a genetic component, which is most probably triggered by environmental stressors, including noise and other kinds of chemical and electronic pollutants in food, clothes, infant paraphernalia, water, the air and the earth.

If we can identify these stressors, we can try to eliminate them from fetuses', neonates', babies' and toddlers' environments. By returning the child to a more natural developmental environment, including the patterned sounds of speech and the three-dimensional shapes in the range of colors of the real as opposed to the virtual world of television and the computer screen, we will, as caregivers, be promoting normal attention, action and perception. The research with rat pups reassures us of the possibility of recovery, at least, in the case of sound. Still, we have to ask ourselves, what is normal?

Is autism arrested development or hyper-arousal¹⁰ or both? Is it a developmental/attentional problem? Is it a hands-on deficit, where children do not get a chance to explore the three dimensional natural world¹¹ or to draw and thus lose an understanding of how things relate to each other.¹¹

"The Geek Syndrome: Autism and it's milder cousin Asperger's Syndrome - is surging among the children of Silicon Valley. Are math-and-tech genes to blame?"

³¹Greenspan, Stanley M.D., 1999. *Building Healthy Minds: The Six Experiences that Create Intelligence and Emotional Growth in Babies and Young Children*. With Nancy Breslau Lewis. Perseus Books, Cambridge, MA.

⁵¹Molnar-Szakacs, Istvan. 2008. "Using Music To Explore The Neural Bases Of Emotional 'Processing' In The Autistic Brain." University of California - Los Angeles (2008, May 14).

⁴³Chang, Edward, Merzenich, Michael, "Environmental Noise Retards Auditory Cortical Development," *Science* Magazine, March 2003.

¹⁰Grandin, Temple, 2009. *Animals Make Us Human*. Creating the Best Life for Animals. Houghton Mifflin Harcourt: Boston, New York.

¹¹Louv, Richard, 2005. *Lost Child in the Woods*, Saving Older Children from Nature-Deficit Disorder. Chapel Hill; Algonquin Books.

An article in the computer magazine *Wired* (2001)⁵² reported that SunMicrosoft was adding health benefits for autism. A friend of mine who is a computer programmer in New York, observed that computer programmers “tend toward a kind of autism, anyway.” He meant by this that there’s a new breed of very bright people whose top priorities are neither social nor verbal, but systematics --- logical programming, or “screen-thinking” in the narrow sense, or STN, meaning involvement with image/text production to the exclusion of much physical or social or emotional interaction with the non-virtual environment.

My friend, added, "If you put two programmers together, you get more of this kind of brain." (See also Ridley, *Nature via Nurture*, on Aspergers', 2003, p. 62⁵³). The fact that one huge technology company, SunMicrosoft, matter-of-factly identified and accepted technology-related brain changes in 2001, providing health care coverage for increasing numbers of autistic children --- forthrightly labeled as such --- being born in Silicon Valley to couples working in technology, is pretty startling.

It looks like we’re creating, both genetically and environmentally, a new category of children whose behavior might fall under the category “technologically-induced autism.” A positive description might be “highly systematic minds in people who prefer to work solo.”⁵³

In fact, if the signature activity of the information age, or the 21st century, is the use of electronic media,^{43,44,54} then perhaps the "signature" child of this age is autistic? If childhood autism is a transitional brain state, then, perhaps, because it is so problematic, childhood autism will force the design of electronic media that are appropriate to the development of immature visual and aural brain systems, so that children will be able to receive and produce language and relate to others and control attention and hyperactivity and mood. The "modified" autistic child might then become "invaluable to the ongoing evolution of the human race" (Silberman, quoting ICSF neurologist Kirk Wilhelmsen, 2001).⁵²

Television and computer watching and children

Television watching in children between the ages of one and three is now linked with problems in attention, and with restlessness, and impulsivity.⁵⁴ The American Academy of Pediatrics cautions against television viewing in children under the age of two (www.aap.org/pubed/ZZZGF8VOQ7C). As caregivers, we need to do two things:

1. Take white noise “sound machines” (including fans and loud air conditioners) out of the nursery and children’s bedrooms.
2. Keep newborns, babies and toddlers away from the TV and computers and other electronic technologies until they are at least three years old. We

⁵² Silberman, Steve, 2001. “The Geek Syndrome: Autism - and its milder cousin Asperger’s syndrome - is surging among the children of Silicon Valley. Are math-and-tech genes to blame?,” *Wired* Magazine, © Wired Digital Inc.

⁵³ Ridley, Matt. *Nature Versus Nurture: Genes, Experience and what makes us Human*, 2003, New York, Harper Collins.

⁴³ Chang, Edward, Merzenich, Michael, “Environmental Noise Retards Auditory Cortical Development,” *Science* Magazine, March 2003.

⁴⁴ Chang, Edward; Shaowen Bao, Kazuo Imaizumi, Christoph E. Schreiner, and Michael M. Merzenich. 2005. "Development of spectral and temporal response selectivity in the auditory cortex." The National Academy of Sciences. Univ. of CA, San Francisco.

⁵⁴ Doidge, Hermann, 2007. *The Brain that Changes Itself*, page 291. Penguin Books: New York.

should never park infants in front of the TV or sit for hours with our baby on our laps as we work or play on the computer.

As caregivers, we can make our daycare centers, offices, and classrooms quieter. We can turn off lighted television and computer screens, creating a peaceful place for scribbling and talking and reading and singing lullabies with children. It will do us good, too.

Overview:

Childhood development and electronics

Try taking a walk some night. Look into your neighbors' living rooms. Watch the television screens. You will notice how fast the images and colors shift. For older adults like me who are not used to watching electronic screens, it's a stomach-churning experience. Still, our adult brains have got used to watching television. Our adult brains can handle the lighted screen and surround-sound and even tolerate channel-surfing.

***"Every child is an artist.
The problem is how to
remain an artist once he
grows up."***

Pablo Picasso

Little children's brains are not designed for electronic screens. To date, electronic screens are not designed for little children's brains.^{24,55} Electronic images are both too fast and too poor in sensory, pixel-driven content to be appropriate brain-growers for little children. Despite the claims of software designed for infants and toddlers, the lighted screen is a deficient and therefore damaging method of delivery for developmental visual and aural stimuli for very young children⁵⁵ - quite apart from whether the video or the program itself is an appropriate substitute for parenting, especially in infants. The lighted screen is, of course, completely deficient in terms of appropriate motor stimulation for infants and toddlers. They sit. They watch. For older children, the enforced physical constraints of electronics is causing physical and mental health problems, from obesity to aggression and depression.

The new Wii sports technologies allow young children to bowl, play baseball, and golf, but the body/brain kinesthetics of feeling an actual bat connect with an actual ball is lacking, to say nothing of the missing natural world. Where's the sun, wind, grass, birds, the day-dreaming out in left field?

The Wii sports technologies do work with hand/eye coordination, as do all video games. The motor maps for button-pushing forefingers on children's brain maps must be getting enormous, with corresponding loss of motor maps for the other fingers, as well as diminishing motor maps for legs and arms in coordinated action.

Children are at risk for evolving away from their bodies' and brains' own rhythms, or "wobble rates." Their sensory-motor integration, their interaction rhythms, their basic brain oscillations and periodicity are being interrupted and disrupted by electronic influences that simply have not been designed for them in mind and, even if they were, would not replace loving, invested human contact, including shared gaze and speech.

²⁴Short, Kathy, Kauffman, Gloria, Kahn, Leslie H. 2000 "I just need to draw: Responding to literature across multiple sign systems." *The Reading Teacher*, October, pp. 160-171.

⁵⁵Solomon, Richard Jay, 2002. "As if you were there: Matching Machine Vision to Human Vision," *The Hybrid Vigor Journal*, V1. 3:04-2002.

Using the body to think

Children's hands are getting very good at manipulating a mouse or a joystick or thumb-activated buttons on electronic play and learning devices. Still increasing numbers of children have trouble with relating to themselves and others, as well as with expressing themselves at home and at school.

Research supports the fact that young children's mark-making needs to be done at a bodily level, with the hands.^{1,35,48,49,50,56,57} A physically disadvantaged child who can not use his hands to write can use a light pen in his teeth to write or even voice-activated software. But, in general, a child's hands are there for a purpose and that purpose is to explore and manipulate the world through touch and through marks.

My mother used to say, "How do I know what I think 'til I hear what I say?" We could expand Mom's comment to, "How do I know what I think until I dance it, sing it, draw it, write it, compute it, compose it?" We have no idea what we really think or mean until we express it and no one else does either.

Research with speech and behavior

If a wolf raises a human child, that child will not speak. If you try to teach that child to talk later in life, that child will have trouble learning to talk. If you shut a child in a closet, not only will that child not learn to speak, but that child will have a hard time relating to other people when you let that child out of the closet. Early experience with caring human beings is a requirement for a normal development in childhood. Learning disabilities, speech delays and social deficits can be induced.

Parents know about certain dangers for children; lead paint, busy streets, sharp knives, small objects, electric outlets, high counters, heavy, tippy objects. But what about the dangers we can not see, feel, or touch?

Except genetically, normal parents do not "cause" attention deficits, learning disabilities or social deficits. Let's adopt a



Nate and Ben Allen, 2008

¹Sheridan, S.R.. 2005 "A Theory of Marks and Mind: the effect of notational systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children," *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable in on-site version at www.drawingwriting.com by permission by Elsevier. Hyper-text link to Medical Hypotheses ScienceDirect Page att: <http://www.sciencedirect.com/science/journal/03069877>.

Sheridan, S.R.. 2004 "Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness," *Toward a Science of Consciousness*, Tucson, abstract #209.

⁴⁸Petitto, L.A., Holowka, S., Sergio, L. & Ostry, D. (06 Sep 2001). "Language rhythms in babies' hand movements." *Nature*, 413, 35-36.

⁴⁹Petitto, L.A., Zatorre, R.J., Gauna, K., Nikelski, E.J., Dostie, D., & Evans, A. C. 2000. "Speech-like cerebral activity in profoundly deaf people while processing signed languages: Implications for the neural basis of all human language." *Proceedings of the National Academy of Sciences*, vol 97, 25, 13961-13966.

⁵⁰Petitto, L. A., 2000. "On the biological foundations of human language." In K. Emmorey and H. Lane (Eds.) *The Signs of Language Revisited: An anthology in honor of Ursula Bellugi and Edward Klima*. Mahwah, N.J.: LEA, pp. 447-471.

⁵⁶Petitto, L.A., Marentette, P.F. 1991. "Babbling in the manual mode: Evidence of the ontogeny of language." *Science*, vol. 251, pp. 1493-1496.

³⁵Meister IG, Boroojerdi B, Foltys H, Sparing R, Huber W, Topper R. "Motor cortex hand area and speech: implications for the development of language." *Neuropsychologia* 2003; 41:401-406.

⁵⁷Streri, A. 2003. "Cross-modal recognition of shape from hand to eyes in human newborns," *Somatosensory Motor Research*. 2003;20(1):13-8.

positive approach to our worries about child development by *encouraging* attention, connection and literacy, through a program like Scribbling/Drawing/Writing.

Research with vision and action should support the following speculations

If a child were, by chance, raised in a world exclusively made up of brilliant day-glo colors, like the outfits on the Telly Tubbys on the British TV program, research predicts that the child will not be able to see the range of subtler hues in the natural world as anything other than shades of gray. Such visual conditioning would devalue the natural world as a place for engagement and learning because that world would be “all gray” (implications, from Solomon, 2003).⁵⁵

The same kind of conditioning through frequent exposure to the brightly colored, fast-moving, hyper-athletic/super-hero leaping and jumping, shooting and blasting featured on young children’s video games would similarly devalue the world of nature as an interesting environment for children because what is natural, in the “real” world of humans, animals, things and plants would seem, by contrast, too dull in color, too slow in action, too tame in emotion to be worth consideration. Life would only be fun “in the game.” The classroom would be out, while the virtual battlefield would be in.

As caregivers, we have a choice about what we allow to go into infants’ and toddlers’ and 3 and 4 year old’s (our pre-schoolers’) eyes, mouths, and ears.

Brain science for young children

Brain science provides valuable information about the neurophysiology of attention, vision, emotion, cognition, memory and learning, clarifying the connections between these systems. By mining brain science and research (William Condon, Jaak Panksepp, Jean-Pierre Changeux, Semir Zeki, Walter Freeman, Albert Galaburda, Stephen Kosslyn, Antonio Damasio, Daniel Goleman, Rodolfo Llinás, Susan Goldin-Meadow, LauraAnn Petitto, Mihaly Csikszentmihalyi, Dean Falk, Craig Kinsley, Norman Doidge, Michael Merzenich, Paul Bach-y-Rita, and Edward



Nate and Ben Allen, 2008

Taub to name just a few), design cues for an early language program that promotes focused, sustained attention and learning become clear; connect the work of the hands including scribbling and drawing, with the work of the tongue, or speech and then encourage the brain that’s learning to be verbal and literate to write and read (words, pictures, music, math) in the midst of the lively interest and positive emotion that spring from that child’s excitement over her earliest sounds and marks. A brain trained in this manner to pay attention and to express itself will be well prepared for life.

Until brain scans compare brain states, what can we know?

Until brain scans compare brain states in rhesus monkeys pushing coded buttons for rewards with brain states of preverbal scribbling toddlers, as well as with brain states of verbal children

⁵⁵Solomon, Richard Jay, 2002. “As if you were there: Matching Machine Vision to Human Vision,” *The Hybrid Vigor Journal*, V1. 3:04-2002.

engaged in scribbling and drawing, we will lack images and information about the structures, waves and neurochemistry that distinguish verbal, literate (symbolic) human thought from creaturely (symbolic) thought. Until then, we'll have to be content with our everyday observations; human children scribble and draw as innate behavior and they learn to talk in extended, original sentences, while other primates and even green parrots, don't.

Primates scribble, too. In intense mentoring situations with researcher/handlers, primates learn not only to communicate by pushing buttons with icons, but to scribble more intentionally.^{58,59,60,61} Without resorting to research articles, you and I still know from our everyday experience that human beings draw, write, calculate using numbers and formulae and equations and compose music and that, so far, other primates do not make these kinds of marks. In time, maybe apes will and we won't. But we aren't there yet. There's always remediation and plasticity. The brain can and will re-invent itself.



Wyatt Allen, 2007

Mother, teacher, researcher

I've taught art, English and Science for ten years at the middle school level. I've taught studio arts and art history for seven years at the college level. For several years, I ran an after-school Drawing/Writing program for children in my neighborhood here in Maine. No matter what the age level or subject matter, I use Drawing/Writing as my method of delivery. My students draw in English classrooms and they write in art studios.

I have worked with children with attention deficits, children with learning disabilities, children with primary languages other than English (ESL students). I have taught eighty-year old Elderhostlers, and talented and gifted fifteen year-old Native American students. In all of these situations, I've used the teaching and learning strategy called Drawing/Writing.

I've taught adults in maximum security prisons, and adults in back-to-work, job-training programs. I have taught teachers,



Self Portrait 1962

⁵⁸Rumbaugh, Duane M. 1980 Language behavior of apes. In Thomas A. Sebok and Jean-Umiker-Sebok (eds): *Speaking of Apes: A Critical Anthology of Two-Way Communication with Man*. New York: Plenum Press, pps.231-259.

⁵⁹Savage-Rumbaugh, E.S. Murphy, J. Sevcik, R.A. Rumbaugh, D.M. Brakke, K.E. and Williams 2004. "Language comprehension in ape and child." Monographs of the *Society of Child Development*.

⁶⁰Savage-Rumbaugh, S. & Roger Lewin 1994 *Kanzi: The Ape at the Brink of the Human Mind*. New York: John Wiley and Sons.

⁶¹Santos L.R., Hauser M.D., Spelke E.S. 2001. "Recognition and categorization of biologically significant objects by rhesus monkeys (*Macaca mulatta*): the domain of food," *Cognition*, 2001 Dec: 82 (2):127-55.

Saving Literacy



Self Portrait 1991



*Photo, author, "reading," 1944,
at age 2*

principals and superintendents, professors and deans. I have taught math teachers and science teachers, English teachers, and art teachers, computer science teachers and history teachers. I have taught Harvard astrophysicists. Astrophysicists and elementary school teachers understand the importance of scribbling and drawing most easily.

I have taught little children in Patagonia Elementary School in Southern Arizona in a facility whose total population is 55. It was there that two little third-graders told me exactly what drawing did for the human mind: "Drawing is fun and it gets the brain ready for writing."

I have worked with children whose lives are deprived and who are still lively and alert, passionately eager to learn and I have worked with children whose lives are materially rich, but who have trouble with learning and who are losing their edge when it comes to enthusiasm about learning.

As an artist, I know the kind of mark-making called drawing from the inside out, and as a writer, I know that kind of mark-making from the inside out, too. I know about mothering and grandmothering and I never cease to be amazed by children's marks and words.

Toward a Peaceable Kingdom



Toward A Peaceable Kingdom

The Peaceable Kingdom, S.R. Sheridan, oils, 48x60, 1987

Isaiah 11:6-9. "The wolf shall dwell with the lamb, and the leopard shall lie down with the kid, And the calf and the lion and the fatling together, and a little child shall lead them. The cow and the bear shall feed; their young shall lie down together; and the lion shall eat straw like the ox. The sucking child shall play over the hole of the asp, and the weaned child shall put his hand on the adder's den. They shall not hurt nor destroy in all my holy mountain; For the earth shall be full of the knowledge of the Lord as the waters cover the seas."

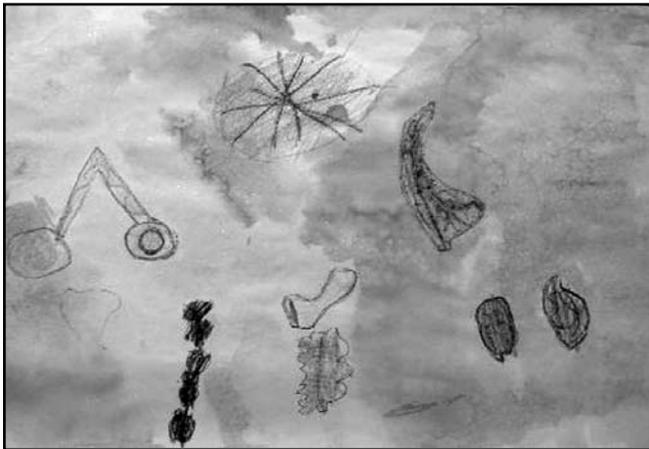
Growing Past Ancient Neurochemistries

“Multa pixit, hic Brugelius, quae pingi non possunt.”

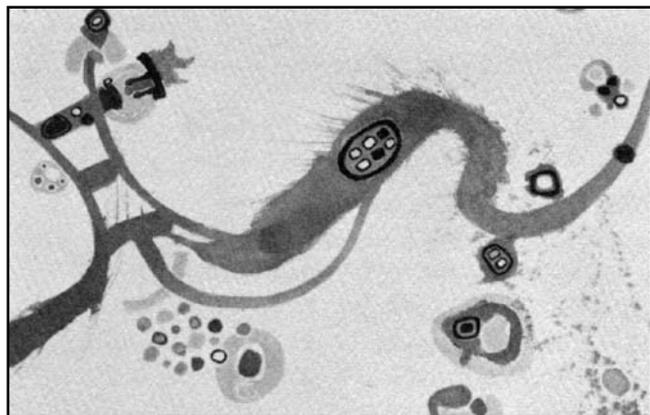
Abraham Ortelius wrote this epitaph for his friend, Pieter Bruegel, the Netherlandish painter.

“Much he painted which cannot be painted;” that’s what Ortelius wrote. Have you seen Bruegel’s painting “Hunters in the Snow”? Or “The Corn Harvest”? Or “The Return of the Herds”? Is there a painting by Van Gogh or Mary Cassatt or Renoir which you especially love? The paintings that are beloved through time are the ones ***that paint what cannot be painted.***

Much the child scribbled which could not be drawn. Much the child drew which could not be said or written.



Ben, 2008, age 7



C. Ronald Bechtle, watercolor, 2006, age 82

Language is a pseudopod

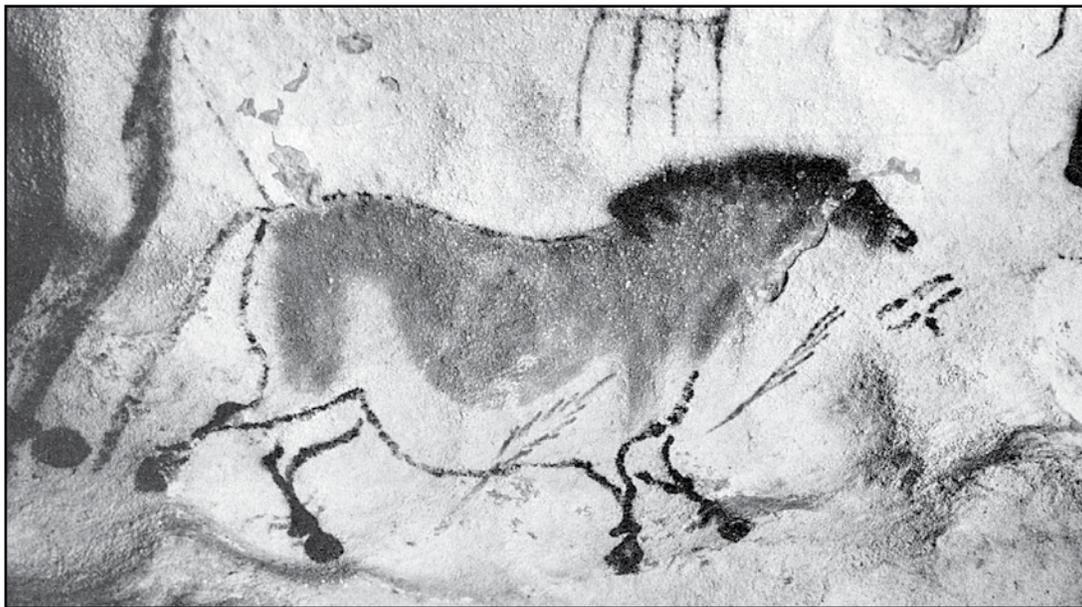
Intelligent responses in biological organisms preserve freedom of movement, extend possibilities for nourishing attachment and receive life-sustaining information, while ridding itself of damaging information. The organism which relates symbiotically to its environment will not destroy it. It will achieve synergy. It will conserve energy. It will achieve restful, healing states across biological levels, including levels of consciousness.

Language is a pseudopod for an organism that reaches for the unknowable, using symbols. A cell reaches out in response to neurochemical signal pathways. It doesn't think about the unknown. The unknown doesn't exist for a cell. It has to go in the direction indicated by the neurochemistry of the environment. It does not make decisions about extending a pseudopod. Whither it is called, it goes.

If a cell is cut off from its environment, it dies. Humans have a resilience beyond the rules of biology. Because of language, they can survive separation from the substrate (loss of a parent, a spouse, a home, a job, their health). Human brains can invent new ways to connect. The human brain can even create a safe place to be inside itself, a place where pain and loss go away, a place where the mind finds peace.

That is what art does for us, literature, music, mathematics. Prayer, therapy, meditation, give us peace, too. But this book is about literacy and emotional health and control. It is about how marks change minds, creating order where there was disorder, creating meaning where there was confusion, peace where there was conflict, beauty where there was ugliness, health where there was sickness. We can achieve a balanced system, not only physiologically, but psychologically, through literacy. Language is our outreach system for a special mitosis, a special symbiosis, a special relationship with the world.

The Wall Painting: Old and new technology



"The Chinese Horse," Lascaux, France. Reprinted by permission of Yvonne Vertut, Copyright by Jean Vertut. All rights reserved

The Paleolithic wall painting "The Chinese Horse" - reminds us that human beings think using pictures and other symbols - not just spoken words. With the invention of the printing press, the symbol system we describe as text became dominant. Humankind focused on reading words, relegating pictures to children's storybooks or scientific illustrations. Until recently, images have served text instead of the other way around. Only on cave walls and in art museums do images stand alone, sufficient as meaning.



Nate and Ben Allen, 2007

Currently, image-processing technology, including television and computer images, makes new kinds of image-text presentations possible, including kinetic, screen-based modeling impossible to achieve on pieces of paper. In fact, the child might be described as “post-textural.”⁶² Children’s visual and verbal experiences are increasingly electronic, leaning heavily toward image, away from text. Within a generation or two (all the time it takes for such a change) static words, numbers, notes on a page may not be interesting to children or even visible.

Still, let’s remember “the wisdom of Solomon” (Pennsylvania University’s Solomon!) about the human visual system, striving to design more eye-like image processing, and more ear-like aural presentations for children! And let’s also continue to think about children’s drawings as appropriate image processing for young brains.

The method and the content of the child’s own handmade drawing springs from the exact capabilities of his visual system. For the child, his own image production is perfectly timed and perfectly complete for the child.

With practice, handmade visual information becomes better timed and more informational. If Solomon is right, “screen thinking” (both television and the computer) is teaching our children to see less information, faster, at neurally inappropriate rates. Since the young brain is adaptable, or “plastic,” the child’s brain will learn to accept “screen thinking,” and, in time, will accept screen thinking as how his visual system should see. One thing is sure: the child’s seeing and hearing systems will adapt to screen thinking.

The Logic of Environmental Pressures

The logic of environmental pressures on genetics is that, over time (as several generations of research with male bird’s spring courting songs prove), human vision will change to accommodate the “screen vision” of the computer and the television (electronic media, including films and computer games will also replicate human binocular, 3-D vision, making “virtual” worlds even more alluring, tempting children and adults away from engagement in the less dramatic real world.) In the process of accommodation, brains in transition will have some problems. We do not know if these problems with attention, emotion, intimacy and literacy will persist or will somehow resolve themselves.

The fact that our brains and other mammals’ brains are continuous is good news. We share many of our multiple intelligences with other creatures and, in fact, we fall far short of their intelligences in terms of visual skills, physical skills, and emotional skills. Emotionally, animals provide stellar models for us. For instance, most of us fall far short of the emotional sensitivity and responsiveness and the faithfulness of Golden Retrievers.

⁶²Baetens, Jan. 2003. “Looking at McLuhan: ‘Remediation, Iconophobia and Denial of the Body’ in *The Medium is the Message*, narrative Online Magazine of the Image [8] visual narrative, Issue 5.

Still, unlike Golden Retrievers, we can speak, using words and we can draw and write. We have the possibility of controlling rage, panic and fear, seeking new solutions to emotional situations in ways animals can not. In this lies our salvation.

When they are watching television, children have no chance to exercise their imaginations.

War is an emotional problem, whatever else it may be. Could it also be a visual problem? Could it be part of the way we've learned to see?

Eyes located farther apart, out on the side of the head, were designed for animals who are prey-like deer, for instance -- giving them a wider visual field. Eyes located closer together, on the front of the face, are designed for predators, providing sharper focus for judging exact location. Our eyes are close together on the front of our faces; we're predators. Long ago, we humans were preyed upon by much stronger animals. One of our biggest fears was of being eaten. Our larger brains and our weapons have helped us to think and to act like predators. Still, despite the placement of our eyes in the middle of our faces, part of our creaturely heritage is to feel like prey (Sam Sheridan, *A Fighter's Heart*, 2007, page 62).

Then, there are the distractions in our visual world; many stimuli are competing for our attention. Most often, it's the lighted screen. Try talking with someone while sitting in a room where the television or the computer is turned on. It's pretty hard to fight the visual "draw" of the lighted screen! The lighted screen is our flickering fire, with all the pull of the fire's ancient visual fascination, but none of its warmth!

We can't change the position of our eyes. On the other hand, we can turn off the television when we want to talk with someone. We're capable of changing how we use our eyes. Semir Zeki writes that our eyes seek universals. If we see the Other as Us, for instance, all humanity as a unity, all life, animate and inanimate as a unity, that's one way to start seeing universality. Would seeing all life as a symbiotic, mutually dependent unity change our fearful/predatory nature? Would we choose peace instead of war?

Changing Brain Chemistries

To change how we see, our brain chemistry, species-wide, has to change. Because it's hard "to teach an old dog new tricks," it makes sense to start new ways of seeing with the very young. Jaak Panksepp (*Affective Neuroscience*, 1998) gives us a fine starting point with his analysis of our emotional circuitry: RAGE, FEAR, PANIC, SEEK, PLAY. By concentrating on SEEK and PLAY as neurochemically positive emotions, we may be able to grow past antiquated, non-useful drives, needs, feelings and behaviors. We must change how we see and feel before we can change how we act. This means that children's computer games should focus on SEEK and PLAY themes, not on violence, fear, panic, and destruction.

Rage Control and the Possibilities of Peace

Rage control is a problem for many of us, including young adults. Because the frontal lobes of the human brain do not mature until the age of twenty, or even twenty-five,⁶³ teenagers lack the

⁶³Wallis, Claudia; Dell, Kristina, with reporting by Alice Park/New York. "What Makes Teens Tick?" *Time Magazine*, May 10, 2004.

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judgement necessary to control emotional behavior, including rage. Drawing and writing provide strategies for helping the young brain work with negative emotions, intelligently.

One of the major issues for the 21st century will be how we conduct our relationships on personal, national and international relations. Rage surely is counterproductive to all such relationships, shutting off, as it does, drives toward playful/peaceable, inventive/seeking solutions.

We need mental tools to help us know and understand, empathize and compromise. We need peaceable strategies for a peaceable kingdom.

Brain science shows us that the SEEKING and PLAY systems turn off, or inhibit RAGE, PANIC and FEAR. Brain science also shows us that we have two distinct selves in our brain, the left hemisphere "I" self and the right hemisphere "We" self where all distinctions are erased between us and the other.⁶⁴ Drawing is a right-brain activity. Along with other non-verbal activities, drawing helps us to access a non-divisive consciousness, experiencing the brother/sisterhood of man. Clearly, strategies for accessing our holistic right-brain consciousness states are useful to living together on this planet in mutual agreement and support.

In the final analysis, it is not just the "spatial" and "non-verbal" aspects of the right hemisphere of the brain that make right-brain experience so valuable to the human endeavor. It is the right hemisphere's ability to merge our consciousness with the consciousness of "All that Is" that makes this side of our brain so valuable to our existence. Speech and literacy (and spiritual practice) allow us to translate that appreciation for our connectedness into action. The right brain inspires us to appreciate the oneness of our world and humankind; the left brain allows us to take action in behalf of our world, including humankind.⁶⁴

Surely, we must come together as families. We must grow beyond our divisive differences personally, locally, nationally, and globally. We have the necessary tools embedded in our brains, hearts and hands.

A Prayer

May we humans, including parents, other caregivers and children, come closer together in mutual understanding and respect. We are in need of practical methods for self-knowledge and reconciliation, including how to evolve beyond rage, and fear. Our souls are unsteady in an unsteady universe. As the potters of the clay of our own souls, we require new methods for self-centering. May marks of meaning guide our hands.

⁶⁴Taylor, Jill Bolte, "Powerful Stroke of Insight," a video, www.ted.com/index.php/talks/jill_bolte_taylor_s_powerful_stroke_of_insight.html



Isabel 8/15/09

Isabel Guzmán Meyer at age one, scribbling two-handed, executing a proto Strange Attractor scribble-brain stirring, © Deborah Guzmán Meyer, 2009, reproduced with permission of Isabel's parents, Gregory Meyer and Deborah Guzmán Meyer.

Isabel and Strange Attractors

One year-old Isabel's two-handed scribbles astonished me! Yet another little child executes the brain/body patterns which will give rise to literacy and symbolic thought! This two-handed, outward-spiraling mark-making happens over and over again right before our eyes! Scribbles carry our prayers.

Saving Literacy



Six year-old Nate watching one year-old Isabel scribble. © 2009 Deborah Guzmán Meyer



Nate, 6 years old, self portrait, 2009



Nate, 6 years old, drawing his family for entry into 1st grade.





Will and Rory Hannay ©2009, Deborah Elwell Hannay. Reprinted by permission of Peter and Deborah Hannay.

Research Questions, Sheridan papers, 1990-2009

Answers to the following research questions will benefit parents, professional caregivers, and children. These research questions can be organized in five categories:

- One: Early Child Development and Language Learning, Brain and Behavior
- Two: Technology and Brain Development in Children
- Three: AI, or Artificial Intelligence and Brain Research
- Four: Primate and Human Brain/Behavior Research
- Five: Theories about Scribbling at the level of Quantum Physics

The following questions, speculations, predictions and propositions are based on direct experience with drawing and writing, and with research, reason, intuition, and observations and interactions with children. When I use highly technical language, I am resorting to the language

of the research article in an attempt to make sense to readers in that specific field. I am not a neurobiologist nor a quantum physicist. I am, however, a thinker and I care about children's needs and rights to grow and flourish as thinkers and communicators. For them, I will try to understand anything that is necessary to that cause. My strong SEEKING drive will not let me rest until my theory of marks of meaning is clear and comprehensive. My goal is the truth about scribbles and, as importantly, applying that truth for the sake of children's mental and emotional and spiritual well-being. Marks change minds. Marks create meaning. Children create the marks. Children deserve the meaning.

Logic and intuition made the Quantum Theory of Scribbling possible; I suddenly understood the possibility, the *probability*, of transcendent moments of understanding in the human brain, made possible by the power of the manipulation of symbols. It has been critical to extend arguments and explanations of Neuroconstructive theory and the practice of Scribbling/Drawing/Writing beyond the fields of child development and child art to dignify the radical importance of that "art" to the development of the human mind. For this reason, research in anthropology, biology, neuroscience and quantum physics has been necessary a third volume, *The Scribble Hypothesis: Marks Change Minds*, will present this combined research.

ONE: EARLY CHILD DEVELOPMENT AND LANGUAGE LEARNING, BRAIN AND BEHAVIOR

1) Research with babbling and scribbling as integrative, cohering, bilateral brain organizers for speech and literacy will shed light on the importance of early sounds and early mark-making to the brain activity and organization underlying speech and literacy.

PREDICTION: An experiment could test whether spontaneous early speech (babbling) and spontaneous scribbling demonstrate bilateral excitation in both hand areas of the motor cortex. The same could be done with intentional speech and intentional scribbling in, say, three year-olds. Neuroconstructivist theory predicts stronger right sensory-motor cortex excitation by the age of three, especially in male children as they speak. Female brains are more balanced bilaterally, so should show stronger bilateral excitation in both hand areas of the sensory-motor cortex during early speech production, as well as during early mark-making, from the spontaneous to the more intentional.

2) Research with motherese (mothers' distinctively higher-pitched, slower speech around infants), **with infant cooing and laughter, and with infant-babbling and toddler-scribbling** should show the degree to which this group of behaviors is integrative and interdependent, operating as a developmental series of cohering, bilateral brain organizers for speech and literacy.

PREDICTIONS: Neuroconstructive theory proposes that these activities relate to each other as synchronizers and accelerators of brain activity. Research with

scribbling and drawing will determine whether the same purpose is served; that is, scribbling and drawing operate as synchronizers and accelerators of brain activity in brain areas responsible for language and literacy.

3) Research in connection with positive emotion.

“Many positive emotions... broaden the momentary thought-action repertoire... For example, the negative emotions of fear and anxiety involve defensive responses, ... that appear to have evolved to operate very rapidly and automatically, without any necessary conscious processing... (there may have been) different kinds of natural selective pressures that may have shaped evolution of cognitive consequences of negative versus positive emotion. Different evolutionary histories would be consistent with the possibility that positive emotion might more likely involve conscious processes in the mediation of its effects on problem-solving and decision. This possibility deserves empirical testing...” (Frederickson in Kaszniak, 2001, p. 5⁶⁵).

SPECULATION: The importance of emotions to brain function and human thought,^{66,67,68} especially the work of Jaak Panksepp, 1998, who identifies a quartet of human emotions (PANIC, FEAR, RAGE, SEEKING), allows us to think about literacy in new ways as positive, conscious, problem-solving, problem-oriented SEEKING behavior. SEEKING behavior receives the benefit of rewarding, motivational neurotransmitters. If literacy, as a SEEKING behavior, is a refinement of an ancient, powerfully positive emotional drive, designed to encourage humans to discover and explore and use things in their environment of special usefulness or pleasure, allowing them to solve problems and make decisions in the context of that SEEKING, then we’ve redefined literacy as a survival skill for which evolution selected, strongly.

Seeking and playing with symbolic meaning makes human brains unique.

PREDICTION: Work with Scribbling/Drawing/Writing as SEEKING behavior encourages positive emotion around literacy. Positive emotion, emotional control, sustained attention, and learning are connected. The opposite is true: negativity, impulsivity/hyperactivity, attention deficits, and learning disabilities are connected. Scribbling/Drawing/Writing works to mitigate or even eliminate these connected non-useful conditions in early childhood.

QUESTION: Can integrative, regulatory mind/body activities like Scribbling/

⁶⁵Kaszniak, Alfred, ed. (2001). “Some Future Directions in the Study of Emotion and Consciousness,” *Emotions, Qualia and Consciousness*, EL Sevier Press, UK.

⁶⁶Demasio, A., 1999. *The Feeling of What Happens*. New York: Harcourt, Inc.

⁶⁷LeDoux, J., *The Emotional Brain*. New York: Simon & Schuster, 1996.

⁶⁸Goleman, Daniel, 1994. *Emotional Intelligence: Why it can matter more than IQ*. New York: Bantam Books.

Drawing/Writing lessen the need for - or even make unnecessary - the use of drugs in childhood to influence attention, impulsivity, mood disorders, hyperactivity, and learning disabilities?

4) Rage control/Anger Management/Impulsivity Control

SPECULATION: Longitudinal studies with children and adults using training in sustained visual attention in the context of marks of meaning via the Scribbling/Drawing/Talking/Writing program, should clarify the degree to which mark-making - as an extension of the Panksepp's SEEKING system (from which emotional mode, as we recall from the diagram in the introduction to this book, there are no return mental/emotional/neurochemical paths to RAGE, PANIC or FEAR) is capable of moderating rage or even of repairing brain areas (amygdalas) shriveled by the caustic effect of too much cortisol, the stress brain chemical.

QUESTION: Can parents and children generate their own intervention strategies for panic, fear, and rage through the seeking and playing strategies provided by scribbling and drawing as important aspects and outreach systems for the positive emotional circuits in the brain?

In addition, do scribbling and drawing help children control negative emotions, like anger? Can the simple activity of making marks on paper change frustration or worry or fear into a happy mental state? Only gently, noninvasive intervention with a pad of paper and a handful of bright markers will help us to understand the therapeutic value of mark-making for the child who needs to learn to self-distract and self-regulate in terms of attention and emotion.

QUESTION: Are communication and emotional control two sides of the same coin? Communication and emotional control may not be separable in humans. The frontal lobes, the limbic system, and the language areas, as well as the sensory motor areas for both hands and the tongue may have co-evolved as densely integrated neural systems to provide the brain's own regulation/intervention/correction strategies in situations where fear, panic or rage might occur and should be avoided for the sake of the health, safety and the well being of the individual and of the group.

SPECULATION: As SEEKING and as PLAY, scribbling, speech, drawing and reading/writing a range of symbols and emotional cues may require an integrated circuit in humans for optimum, full and complete performance. Research could be designed in support of this integrated theory of human mental/emotional/linguistic development.

QUESTION: Are sustained attention and the ability to delay gratification connected? If so, Scribbling/Drawing/Writing - as an attention booster - should

contribute to the ability to delay gratification because control over attention provides delaying tactics.^{69,70} This ability to delay gratification by refocusing attention has been shown to correlate with success in life - from relationships to academics to jobs (Walter Mischel's famous Marshmallow Tests conducted in the 1960's and 1970's introduced the importance and the challenge of delaying gratification in the four year-old child).^{69,70}

5) Autism

SPECULATION: The importance of scribbling and drawing to child development is missing or under-represented as prevention and/or as intervention with very young children at risk for autism or with autism. A child's eyes, mouth, hands, and her attentional/visual/verbal brain development are intricately interrelated. How the young child uses her eyes, mouth, hands, and attentional/visual/verbal brain in early childhood determines her emotional, cognitive, and linguistic development. The television and the computer and white noise machines and other environmental noise levels - including mesmerizing and pervasive visual/aural aspects of technology - may disrupt and/or retard normal brain visual/aural development in young children who are dependent upon shared gaze, face-to-face visual and verbal communication and other exploratory body/brain interaction with people and the world organized by nature or by human intention as appropriate stimulation for very young sensory/emotional/motor systems.

QUESTION: How do the brain scans of children born with autism, as well as those who "acquire" autism, differ from the scans of children who are developing normally and who continue to develop normally? Normal brain scans of children babbling, scribbling, drawing, talking and writing can be compared with brain scans of children who are either born autistic or who present as autistic at a certain age (often between two and three years of age). Careful histories can be compiled of the day-to-day experience of both sets of children in terms of exposure to the television, the computer and to meaningful, visual and verbal conversational, human interaction, including shared maternal gaze and other aspects of mother/child interactions in infancy. Measurements of babbling levels, scribbling, drawing, talking and writing levels, can be compared. Besides genetics and the putative influence of a range of toxins in the environment, how does technology effect the brain of the young child? But, also, how does invested human interaction around words and mark-making influence the developing brain of the little child?

PREDICTION: Research with brain scans of very young children babbling,

⁶⁹Mischel, W., Shoda, Y., & Rodriguez, M.L. 1989. Delay of gratification in children. *Science*, 244, 933-938.

⁷⁰Mischel, W., & Ayduk, O. 2004. "Willpower in a cognitive-affective processing system: The dynamics of delay of gratification". In R.F. Baumeister & K.D. Vohs (Eds.), *Handbook of self-regulations: Research, Theory, and Applications* (pp. 99-129). New York: Guilford.

scribbling, talking about scribbles, drawing, talking about drawings, pre-writing and doing early reading, may answer some of the questions about normal development, including the ability to sustain attention and to achieve emotional control as well as acquiring speech and literacy.

Dandelion Children and Orchid Children; new ways of understanding child behavior, with more praise for mothers, who make the difference.

Genes which shape behavior are extremely susceptible to experience, especially in early childhood. Genetic researchers have coined two new terms: dandelion children and orchid children. Dandelions are hardy children, who thrive easily. Orchid children are extra-sensitive and reactive and require a “greenhouse” environment to flourish. However, “with greenhouse care,” such children “bloom spectacularly,” becoming, in many instances, the adults who change society.^{71A} “What happens at the dyadic level, between mother and infant, ultimately affects the very nature and survival of the larger social group.” “Gene-by-interaction” studies prove that the childhood experience of orchid children determines the outcome for those children as teenagers and adults.^{71A}

Between the ages of 1 and 3, some children - the “orchid” children - “indulge heavily in oppositional, aggressive, uncooperative and aggravating behavior.” These children are often ADHD, and are at risk for depression, drug addiction, violence, and social failure. A new theory of child development and child psychology focuses on the orchid child’s special potential for plasticity, or adaptable behavior. Mothers are facing new opportunities for parenting, albeit in difficult situations, “where risk becomes possibility; vulnerability becomes plasticity.”^{71A} Families and society will select for parents who are able to invest in both dandelion children, and in orchid children. An increasing number of children who seek novelty, while exhibiting a restless attention, as well as aggression, suggests a genetic propensity in the general population toward these behaviors.

Literacy, as a set of expressive, contemplative, self-organizing activities, provides important long term strategies for shaping emotional self-control and reasonable behavior in all children through scribbling, drawing, writing and reading. As our genetics transform us in response to the demands of our environment,^{71B} our major invention for orderly, energy-conserving behavior across mind/body systems - symbolic thought, or literacy - continues to provide our refuge from an increasingly hot and noisy environment, as well as our outreach into that stressful world, which is, after all, our matrix, and our mother. And so it comes ‘round; our mother is calling for help.

^{71A}Dobbs, David. 2009. “The Science of Success.” December 2009 issue of The Atlantic Monthly, <http://www.theatlantic.com/doc/print/200912/dobbs-orchid-gene>.

^{71B}Sloop, Christine M. 2009. “Heritable Genetic Diversity and Gene Flow” Conference presentation, Laguna de Santa Rosa Foundation. “There is a potential for rapid species adaptation to avoid local extinction.” Plasticity is one of the raw materials for adaptation. If humans are an endangered species (self-endangered), then plasticity, as the ability to adapt to environmental pressures will be a useful characteristic. The value of the difficult “orchid” child may be just this plasticity. If so, the increase in numbers of “orchid” children is adaptive human behavior.

^{71C}Cloud, John. Jan. 6, 2010. “Why your DNA isn’t your destiny.” *Time/CNN*, Health and Science. www.searchtime.com. A child’s lifetime health can be compromised within one generation via stress, diet, and/or pre-natal diet via genetic influence on sperm or eggs of the parents or grandparents.

**6) Research with mathematics in connection with child development:
Speculations on Zero from the point of view of scribbling.**

Walter J. Freeman asks in his 2009 paper “The neurobiological infrastructure of natural computing: Intentionality”⁴ where the concept of zero comes from in mathematical thinking. Neuroconstructive theory proposes that the idea of zero may arise from the shape of zero. As the beginning point and as the end point of the spiral, the proto-zero exists, a mark of rounded potential meaning.

SPECULATION: In Freeman’s 1991 paper, “The Physiology of Perception”, brain scans, or EEG’s of rabbits sniffing familiar and pleasing items, reveal increasingly organized, ascendant waves of circling, spiraling lines.² As the child’s scribbles move from random, all-over, spaghetti-like, straight lines and dots, to ascending circles, or spirals, (and from thence to circles containing circles and so forth) - children’s scribbles become increasingly thoughtful and organized, indicating not only an increasing ability to focus and to direct attention, but to make intentional, meaningful marks. Is it possible that embedded as both the “alpha” and “omega” of the spiraling scribble, the zero begins and ends, or encloses, early scribbles? Does the shape of a zero, as a place where all spiraling activity both arises and subsides, enchant the young mind, requiring, with time, an explanation powerful enough to let the zero stand alone as a meaningful mark as an important abstract perception?

SPECULATION: Neuroconstructive theory proposes that the shape of zero is inherent and/or prefigured in the child’s circling, spiraling scribbles. Once the zero mark has been made, it can be used to create a body, a head ---- or a zero. The ultimate point of focus is at once almost nothing and almost everything... All of nothing and all of everything might well be defined as the tiniest dot and the hugest, most perfect circle, or, indeed, two reversing spirals, or the symbol of infinity.

TWO: THE EFFECTS OF TECHNOLOGY ON BRAIN DEVELOPMENT IN CHILDREN

7) Research with technology, including frequencies and wavelengths of analog and digital vision and sound production in television, and computers, as well as in dish antennae and other receivers/transponders, including DVD’s and VCR’s could be conducted to determine whether any of these frequencies retard or damage normal development in fetal and infant and toddler brains. Television and dish antennas produce noise which is considered negligible to adults. But is

²Freeman, Walter J.; Broadhead, Peter. 1991. "The Physiology of Perception." *Scientific America*, Feb. 11, 1991. Vol. 264, (2) Pps. 78-85.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

it negligible to fetal, infant and toddler brains? Do some kinds of electronic noise block or scramble immature brain signaling systems?

In addition, neural abuse may be delivered to infant brains by electronics and technology designed for adult brains. “Adult brain” screen and sound, or visual/verbal technology, may mis-align and/or retard the immature body/brain sensory/motor/mind systems of very young children. The child in the infant seat in front of the TV or computer screen has no recourse. He cannot move. He has to receive the inappropriate stimuli.

PREDICTION: If the emotions required for interaction with computer games are hyper-alertness to danger and FEAR/RAGE, then these emotions will be selected as biologically useful. Still, if the conservation of energy remains a cellular requirement and if the biological system is squandering energy emotionally by playing such games for long periods of time, while under-utilizing the rest of the body kinetically, then a neurobiological conflict should arise, resulting in biological break-down. This break down (perhaps signaled currently as a dramatic increase in autistic children and in "orchid" children) will eventually produce new neuro-bio-techno body/brain systems appropriate to life lived in virtual worlds. Then, the only enemies we kill will be imaginary but, by then, we may be, for all intents and purposes, virtual, or imaginary, too.

8) Research with the possible therapeutic use of a lighted screen as it could be designed to be in synchrony with normal human immature visual systems. Might it be possible for “machine vision” (in the context of both television and computer screens) which matches normal immature human visual oscillatory phases, to remediate severe existing neurological disturbances like infantile epilepsy or even other conditions relating to vision and attention like hyperactivity, dyslexia, autism, even Tourette’s Syndrome? This would necessitate redesigning hardware, not just software.

9) Research with neurofeedback and Scribbling/Drawing/Writing.
Can work with Scribbling/Drawing/Writing prevent or alleviate hyperactivity, attention deficits, mood disorders, and learning disabilities?

Clinical work with neurofeedback (Nora Gedguadas, CNS, CNT, Seigfried Othmer, Ph.D., www.eeginfo.com⁷¹) shows that children can learn to self-regulate brain activity, using computer-assisted brain exercises.

QUESTION: If we compare brain waves of children receiving neurofeedback, which facilitates or rewards the child’s ability to calm and regulate right hemisphere brain waves, with the brain waves of children whose brain activity is ineffectually regulated and patterned, lacking any level of intentional control, what signature

⁷¹Gedguadas, Nora, CNS, CNT, Seigfried Othmer, Ph.D., www.eeginfo.com

wavelengths and patterns do we see? How do the brain waves of children receiving neurofeedback training via computer games and EEG's compare with the brain scans of children scribbling and drawing in an intent, focused manner? How do the brain waves of children receiving neurofeedback for human interaction and emotional control via electronic game therapy compare with children making marks and talking about their marks with parents and other invested caregivers using the Scribbling/Drawing/Writing program?

Learning to control emotions and behavior is a life skill. Normal, interested interaction between adults and children around marks and speech may achieve, routinely, the kind of right brain organization which neurofeedback clinicians are looking for. If we make sure some of the critical, if unsung, components of early childhood are supported, including visual and verbal exchanges with loving adults and interested and supportive verbal exchanges around scribbling and drawing, won't normal right and left hemisphere brain patterning in children occur in the context of everyday parenting and caregiving?

THREE: ARTIFICIAL INTELLIGENCE: MODELING SYMBOLIC THOUGHT AND LITERACY

10) AI, or artificial intelligence can be used to model pre-verbal, scribbling thinking in infants and toddlers for the sake of analyzing and understanding the pre-conditions for, and the dynamics of, early acquisition of speech and literacy in humans.

SOME REQUIREMENTS OF AN INTELLIGENT SYMBOL - USING SYSTEM: To model human intelligence, AI would need to build a robot (with eyes and hands) which scribbles and draws and reads its scribbles and drawings, creating internal "neural" models from these actions and shapes. If the child's scribbles and drawings are driven by neural shapes of thought which are already internal as the sensory motor patterns of a biological organism bent on movement, connection and communication, then these neural patterns would have to be programmed into the robot brain, first.

This, as I see it, is the conundrum. To model an intelligent system that uses languages and literacies as the human brain uses them, an AI device must be able to scribble and draw, but this device, this system, this robot can only scribble and draw if its computer/brain/body has already been programmed to do so - which would mean that the programmer had tapped into the algorithms responsible for the neural shapes of young children's pre-verbal babbling, scribbling thought. The developmental compendia of children's unfolding marks as collected by Kellogg and Fein and reproduced in the Sheridan books logically provides some of the

mental/motor operations necessary to modeling the mental/motor pre-conditions of verbal, literate thought, supported by intentional symbolic reasoning.

As scribbling matures and the stages of drawing unfold, these marks of meaning influence the brain via the hand and the eye and the sensory/motor cortex, deep within Dr. Walter Freeman's koniocortex (Freeman's term for brain tissue appropriate to the generation of symbolic reasoning as neural behavior, 2009⁴), to organize and to generate the neural patterns necessary for symbolic thought. Rather than trying to model the neural conditions and operations necessary for symbolic thought using a computer/robot, we can look to the actual unfolding of the neural operations of the thinking child, as he/she babbles, scribbles, draws, speaks, reads and writes.

PREDICTION: If humankind is becoming technological as a whole (and if ontogeny both recapitulates and modifies phylogeny: Dean Falk, in correspondence, Dec. 2003⁷²), then the pressure on the child's brain to adapt to technology will bring about changes in line with the requirements of technology for its kind of motility, its kind of adhesion, its kind of transduction. Clearly, technology requires quick eyes and quick fingers. It needs the rest of the body peripherally, as a support system for the hands/eyes/brain as these three entities interact with a keyboard, a mouse and a lighted screen - which is projecting information via certain raster rates and certain colors and certain codes determined by hardware and software with which the human hardware and software must be able to interface.

FOUR: PRIMATE BRAIN RESEARCH: (from the Sheridan position paper, "A Theory of Marks and Mind: the effect of notational systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children", Medical Hypotheses, 2004 Elsevier Ltd.¹).

PROPOSITION: Bipedalism and upright posture created reverse blood flow, which cooled the brain allowing for a larger brain. Thereafter, marks of meaning --- beginning with doodling in the dust by solitary toddlers as well as notational systems invented by hunter/gatherers,⁷³ both male and female, to keep track of natural cycles and periodic events and processes --- placed substantial visual/attentional pressure on the proto-hominid visual cortex, the dextrous, expressive hands, and the vocalizing mouth, as well as on the motivational/emotional limbic system, driving brain growth in terms of:

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

⁷²Falk, D., "The 'putting baby down' hypothesis: Bipedalism, babbling, and baby slings," a position paper, published on Falk's web site, 2003. Falk comments on Sheridan's responses.

⁷³Marshall, A., 1991. *The Roots of Civilization*. New York: Moyer Bell Limited.

SPECULATION:

- brain lateralization, allowing increased specialization and thus, increased efficiency for spatial and linguistic tasks.
- brain de-lateralization, or de novo unification via the agency of scribbling and drawing, introducing spatial input - as visualization, imagination, plus the visual complexities of spatial relationships of drawn marks - strongly contributed to deep, brain-structural grammatical complexities. These brain-structural complexities supported and extended written language and continue to do so now.
- bihemispheric, corpus callosal transfer, making it possible for the human brain to use drawn and written "alphabets" or marks-based literacies to modify speech in connection with attention, memory, articulation, semantics and grammar, as well as to translate meaning across systems of representation, for instance, changing a drawing into words, words into music, music into mathematics.
- the creation of a new awareness, or consciousness state due to increasingly focused attention in connection with a growing working memory,⁷⁴ appreciably expanded by new representations created by children's drawings and mothers' notational systems.
- emotional (endocrine-driven) motivation for thinking using symbols, offsetting the metabolically costly effect of brains which require so much information about humans and their doings.⁷⁴
- cognitive motivation (emotion-driven) for inventing words to describe the range of marks early hominins produced to communicate around and beyond then-existing vocalizations and speech.

This brain growth, in turn, created:

SPECULATIONS:

- adaptive pressure for increased prefrontal lobe capabilities with symbols.
- the possibility of increased synchronization via dyadic, call and response exchanges not only between mother and child, but between visual and verbal thinking in individual brains (including the far-reaching effects of callosal transfer described above).
- increased levels of synchronization, which, in turn, increased levels of positive emotion, while conserving energy, which, in turn, made extra processing reserves available for images and words and other complex symbol systems.

⁷⁴Charlton, B.G., "Evolution and the cognitive neuroscience of awareness, consciousness and language." *Psychiatry and the Human Condition*. Oxford: Radcliffe Medical Text appendix, 2000.

- "mom-binding"⁵ and "time-binding,"⁷³, as well as a "theory of mind"⁷⁴ as additional dividends of the highly adaptive "displaced" capabilities of long-distance communication around infant signal crying,⁷⁵ motherese,^{72,76} and youngsters' scribbling and drawing, along with other mark-making systems invented by hominid children and their mothers to work with the seasons of their lives, as well as with the seasons of the plants and animals on which they depended.

11) These questions arise around hominid evolution in connection with speech and literacy:

QUESTIONS:

- Were until-now-unidentified marks of meaning near hominid footprints in lava dust, especially those marks located in the lava dust beyond sight-lines for lakes, springs or groves, actually directional indicators and/or locators (maps) for water or more abundant food sources? That is, were marks of meaning already being "drawn/written" at this time?
- Did the sling-nursing position (which would have been horizontal in immature hominid neonates as opposed to vertical baby chimps' nursing posture) create a swallowing challenge, helping to modify the organization of the throat, larynx, and hyoid bone for speech? How do primate and human vocal apparatus differ in childhood and in adulthood? (For instance, the hyoid bone descends in chimps as they mature, as it does in humans.⁷⁷)
- Did hoot-pant primate laughter⁷⁶ --- in hominins --- increased through mother/child exchanges in response to the extended childhood of dependent, vulnerable offspring, modify the lungs and breathing apparatus to accommodate the explosive sounds necessary for consonants in human speech? How do the lungs and other breathing apparatus of primates and humans differ today?
- What discontinuities do fMRI's identify in brain waves/oscillations/locations in primate and human brains when we focus on the first two to three years of life when very young primates (including humans) start to vocalize and

⁷³Marshack, A., 1991. *The Roots of Civilization*. New York: Moyer Bell Limited.

²⁵Zeki, Semir. 1999 *Inner Vision: An Exploration of Art and the Brain*. London: Oxford University Press.

²⁶Zeki, Semir, 1999 "Art and the Brain," *Journal of Consciousness Studies*, Vol.6, No. 6-7, June/July.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁷⁴Charlton, B.G., "Evolution and the cognitive neuroscience of awareness, consciousness and language." *Psychiatry and the Human Condition*. Oxford: Radcliffe Medical Text appendix, 2000.

⁷⁵Soltis J., "The signal functions of early infant crying." *Behavioral and Brain Sciences*. New York: Cambridge University Press, 2003.

⁷⁶Falk, D., *Braindance*. New York: Henry Holt and Company, 1992/2003.

⁷⁷Nishimura T., Akichika S., Matsuzawa T., "Descent of the larynx in chimpanzee infants." Published online 5/29/03, Proceedings of the National Academy of Science, USA, 2003;10.1073/pnas.1231107100. ³³Fein, Sylvia, *First Drawings: the Genesis of Visual Thinking*. © 1993 by Sylvia Fein. Figures reprinted by permission of Sylvia Fein, January 22, 2003.

gesture? fMRI's of mother/child vocalizations among primates, and verbal exchanges between human mothers and children around scribbles and drawings should provide information on differences in the locations of neural substrates dedicated to language-use in primates and humans, as well as their metabolic profiles, electrical frequencies, and wave sines.

- In young children who scribble and talk at the same time, what happens to the neural substrates?^{73,78} Do scribbling and drawing organize the child's brain for attention, memory, and articulation?
- Controlling for contrast, luminosity and spatial arrangement, can we design experiments with infants, rather than with adults, using human faces, ape faces, and objects? We can extend these experiments by presenting abstract versus representational art to infants: how does their N170 response differ when they look at Mondrian's "Boogie Woogie" versus his earlier painting of a willow tree? Do infants look longer at Picasso's "Demoiselles D'Avignon" than at a "more realistic" blue period painting of acrobats? How about a Cezanne still-life versus a Dutch still-life? Like mature abstract artists^{25,26} and toddlers,^{1,5} do newborns show a preference for abstract geometric shapes? What might this mean for embedded geometric systems? If all notational systems derive from a child's earliest marks, then literacy springs from the internal geometry of the neural shapes of intentional thoughts and actions in time and space.
- If infants are shown geometric shapes in two-dimensional arrays, say the triangle and the square as objects with 3 and with 4 sides, do infants associate 3 sounds or 4 sounds with such shapes, extending the research with the counting of objects in conjunction with hearing a similar number of sounds?⁷⁹ If so, such research might suggest that not only is numeracy, but number-of-sides-sense, or appreciation for the two-dimensional arrays we call geometry, exist as an additional category in an embedded computational system in the human brain. The fact that toddlers scribble 3- and 4-sided shapes spontaneously,^{29,33} using the same basic line invented by Ice Age notational carvers to describe the lunar-based passage of time on bone and stone,⁷³ might extend the notion

⁷³Marshack, A., 1991. *The Roots of Civilization*. New York: Moyer Bell Limited.

⁷⁸Castro-Caldas, K.M. Petersson, A. Reis, S. Stone-Elander & M. Ingvar. "The illiterate brain. Learning to read and write during childhood influences the functional organization of the adult brain." *Brain* 1998; Vol 121, Issue 6, 1053-1063.

²⁵Zeki, Semir. 1999 *Inner Vision: An Exploration of Art and the Brain*. London: Oxford University Press.

²⁶Zeki, Semir, 1999 "Art and the Brain," *Journal of Consciousness Studies*, Vol.6, No. 6-7, June/July.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁷³Marshack, A., 1991. *The Roots of Civilization*. New York: Moyer Bell Limited.

⁷⁸Castro-Caldas, K.M. Petersson, A. Reis, S. Stone-Elander & M. Ingvar. "The illiterate brain. Learning to read and write during childhood influences the functional organization of the adult brain." *Brain* 1998; Vol 121, Issue 6, 1053-1063.

⁷⁹Dehaene, Stanislas, 1997. *The Number Sense*. New York: Oxford University Press.

²⁹Kellogg, Rhoda, *Analyzing Children's Art*, figures on pages 14, 49, 56, 101, and 109 © 1969, 1970 by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

³³Fein, Sylvia, *First Drawings: the Genesis of Visual Thinking*. © 1993 by Sylvia Fein. Figures reprinted by permission of Sylvia Fein, January 22, 2003.

- of embedded computational systems in children's brains to include marks of meaning as embedded systems in humankind.
- What happens to speech and language in a baby whose limbs, especially the hands, are restrained from birth? Is the acquisition of speech impaired? Delayed?
 - If a child is prevented from doing any kind of mark-making throughout early childhood, is there any effect on his brain patterns for speech or for reading and writing? Would this child exhibit some of the symptoms of autism? Attention deficits? Learning disabilities? Acting out? Oppositional behavior? Inability to make human contact?
 - Since primates will scribble, can they be trained to draw? If so, might they "bootstrap" signed language (which some primates already use) onto drawings in such a way that they acquire a large enough vocabulary for original statements, along with a demonstrable understanding of the signs they use, as expressed by the drawings they make to accompany this signing? Other primates do not scribble spontaneously as part of their normal developmental unfolding, nor do they routinely draw, and in this simple absence of mark-making alone may lie the critical deficit in connection with the acquisition of symbolic language and reasoning in primates. Since apes and chimpanzees do not need symbolic language at this point to flourish, this should not matter to *them*.
 - How do mother to child vocalizations among bonobo apes compare with the pitch and cadence of human motherese? How do the rates of delivery of sound, or the hertz, compare? Matrilineal DNA suggests that only one mother had to speak a motherese at 20 Hertz to tune up infant primate brains for language.
 - How do sensory-motor maps in humans and apes compare in amount of tissue dedicated to hands/thumbs/feet and mouths/tongues? What inferences can be drawn from differences (if such differences exist) in these sensory-motor maps?

FIVE: TOWARD A QUANTUM THEORY OF SCRIBBLING

“The Scribble Hypothesis,” Sheridan, 2002 supports the importance of handmade marks to the development of the symbolic human mind and includes a quantum theory of scribbling.

PROPOSITION: Vision and attention are connected operations.^{1,5,6} We propose that, in sighted infants and children, sustained visual attention is necessary for

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁶Sheridan, S.R. 2004 "Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness," *Toward a Science of Consciousness*, Tucson, abstract #209.

speaking, too, as well as for drawing, reading, writing and other marks-based expression. Arguably, the work of the hands as *marks* extended (and still continue to extend) the attentional capabilities of the visual cortex for language. The first six tenets of "The Scribble Hypothesis" anchor this position:

One: Very young children's scribbling trains the brain to pay attention and to sustain attention, setting up self-organizing feedback loops between the eye/hand/ear/mouth and the inter-hemispheric brain.

Two: Very young children's scribbling stimulates individual cells and clusters of cells in the visual cortex for line and shape.

Three: Very young children's scribbles help them practice and organize the shapes or patterns of verbal and visual symbolic thought.

Four: Very young children's scribbling encourages an affinity, or love for marks, preparing the mind for his determining behavior: literacy.

Five: Marks of meaning operate like "super-radiant surfaces," or mirrors, encouraging self-reflection, capable of producing consciousness states describable as self-induced transparency, or epiphanic consciousness (including understanding, wisdom, peace, transcendent at-oneness), rewarding the brain emotionally and neurochemically for its hard-won self-clarification^{3,80A,80} while, at the same time, allowing the brain to settle into minimal, coherent energy states. This resolution across emotional/neural levels is energy-efficient, a highly desirable state in dynamic systems.

Six: Marks of meaning including scribbling are not only critical to the neural development of visual, verbal and emotional thinking in the child, but, as mark-making in general, are instrumental in the maintenance of healthy neurophysiology, including the visual, verbal, emotional, and memory/learning circuitry in the adult brain.

Based on tenets #5 and #6 of the Scribble Hypothesis, it is possible to propose the following neuro-molecular advantages of SIT's, or consciousness states described as Self-Induced Transparency⁵ in the literate human brain. In these speculations, the 1995 paper by Roger Penrose and Stuart Hammeroth,⁸⁰ "What Gaps?" provides the technical language. As explained above, I use this technical language as logically as I can to make my arguments, even though I have no experience of the actual experiments on a quantum level.

³Churchland, Patricia Smith. 1986, *Neurophilosophy*, Cambridge, Mass., MIT Press.

⁸⁰Penrose R., Hammeroff S., What 'Gaps'? Replay to Grush and Churchland. *Journal of Consciousness Studies* 1995; 2 (2):99-112.

^{80A}Zohar D. *The Quantum Self*. New York: William Morrow, Inc, 1990.

PROPOSITION:

- sustained visual attention (analogous to the self-focusing optical phenomena that occurs when photons propagate inside microtubules) achieved by marks of meaning has quantum effects within the noisy, thermal and chaotic intercellular milieu of the thinking brain.

PROPOSITION:

- marks of meaning act as coolants (Bose-Einstein condensates) or like energy pumps (Frohlich model), exciting biomolecules coherently, reducing to a common frequency code... This common frequency mode regulates brain synchronicity as focus, increasing non-linear soliton waves (to maximum tolerance --- like the crest of a foaming wave), initiating self-collapse on non-quantum levels in response to mental breakthroughs (in the form of the "solved" drawing, the resolved symphonic line, the elegant mathematical proof). This self-collapse, or resolution, is experienced emotionally as heightened consciousness, achieved via self-clarifying shifts in visual phenomenal experience. The quantum phrase "self-induced transparency" (or SIT) aptly describes such self-induced, marks-based "aha!" experiences.

SPECULATION:

- the possible quantum mechanics of an SIT (a "self-induced transparency" event) are as follows: marks of meaning cause neural microtubular dephosphorylation releasing sodium, calcium and magnesium ions whose radii are smaller than H²O and so do not disturb the dynamical geometry of sheltered quantum neural states. This means that children who can not work comfortably with marks of meaning (dyslexic children, attention deficit children, autistic children) or who have problems with speech (including stuttering), suffer "decohere Type 2 phenomena" through chloride fluxes in axons which means that ions with too big radii disrupt the dynamically structured layers of water in bio-cytoplasm in the human brain's neural systems at levels which affect conscious emotion, producing sad and discouraged feelings. The brain is then at risk for a cascade of negative emotions, including desperation and depression, as it senses that it is failing to operate effectively. The blockage of calcium, sodium and magnesium by chloride must feel lousy to the brain, much like an engine might feel (if it could feel) when oil, gas, oxygen and spark are cut off. Combustion engines are not equipped with feelings. Humans are.

PREDICTION:

Microtubule-associated protein (MAP-2) "is essential for strengthening synaptic pathways. .. MAP-2 consumes a large proportion of brain biochemical energy and acts to reconfigure the sub-synaptic cytoskeleton... by connecting with smaller cytoskeletal proteins directly involved in neurotransmitter release... This release has a probabilistic component.... and may reflect some unrecognized quantum

influence."⁸⁰ It is arguable that drawing and writing and mathematical notation and musical notation have the possibility of exerting a quantum influence on neurotransmitter release through major phosphorylation. When marks of meaning achieve a break-through in understanding, they increase some probabilistic component for neurotransmitter release necessary for maintaining healthy cells operating in synchronicity. Every mark of meaning is a poised, anticipatory event, leading the hand and the eye onward. As skill levels grow, the coordination of hand and eye achieve automaticity, conserving energy, while allowing the brain to think as long as its biochemical energy supply allows. Marks of meaning make more energy available to the thinking brain.¹ These marks may do so by affecting the "seemingly random" probabilistic component in neural activity, increasing the number of axonal depolarizations which result in vesicle release of neurotransmitters,⁸⁰ thereby, in turn, increasing or sustaining the non-linear soliton waves,^{81,82} that signal brain synchronicity, or oscillations with zero time lags. Conservation of energy on quantum levels and marks-based breakthroughs on consciousness levels, may occur, in the literate human brain, interdependently. It is mutually advantageous for the brain to operate at peak efficiency at quantum levels and to feel enlightened on mental/emotional levels. Enlightenment can be achieved by meditation or through extreme physical exercise, including challenging "flow" experiences.⁸³ The Sheridan position adds to the "flow" list the kind of epiphanies achieved by mark-making: painting, drawing, writing, mathematical calculations, musical compositions and ecstatic spiritual states. Feelings of wholeness or at-oneness may be consciousness's way of experiencing a global PNS/CNS (peripheral and central nervous system) synchronous event, or global collapsed wave function, which occurs when millions of simultaneous, cascading mini-cytoskeletal superposition states coincide. The Sheridan position proposes that super-radiance at the level of the neural cytoskeleton can be experienced as self-induced transparency at the level of the brain, via states of hyper- or super-consciousness (response to page 14, Penrose and Hammeroff, 1995⁸⁰). The mind that is in a state of heightened consciousness feels exceedingly bright and clear to itself. That self is illuminated, refined, clarified by its own agency, the way butter is clarified by heat in a pan on a stove. Cooks know all about clarification. Evidently, microtubules and consciousness states do, too.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁸⁰Penrose R, Hammeroff S., What 'Gaps'? Replay to Grush and Churchland. *Journal of Consciousness Studies* 1995; 2 (2):99-112.

⁸¹Chou, Kuo-Chen, Chun-ting Zhang, and G.M. Maggiora. "Solitary Wave Dynamics as a Mechanism for Explaining the Internal Motion During Microtubule Growth." Computational Chemistry, Upjohn Research Laboratory, Kalamazoo, Michigan 49001, 1994.

⁸²Sataric, M.V.,J.A.Tuszynski, R. Zakula, and Z. Ivic, 1992. "A change of the rate of heterogenous chemical reactions due to Presence of toda solitons," *Surface Sciences* 260, 370-378.

⁸³Czikszentmihalyi, Mihaly, 1993. *The evolving self: a psychology of the third millennium*, N.Y. Harper Perennial.

QUESTION: Do the terms "self-induced transparency" and "super-radiance" associated with quantum microtubular consciousness states⁸⁰ have relevance for the emotional motivation of special, higher-order "transcendent" brain states responsible for neural resolution? Do these terms provide, in fact, apt descriptors for how such clarified higher-level mental states *feel*? A brain that has worked hard to figure out a major problem in life feels lightened (in the sense of being filled with light), even ecstatically clear.

PROPOSITION: Multiple literacies, including art, literature, music, mathematics and spiritual practice are major tools for resolving the over-heating brain consequences of problems encountered in a language-based life.

The Advantage to the Brain of Minimal Energy States

The interesting point about quantum states from microtubules to consciousness is that they protect the brain from its own disruptive thermal energy. As here proposed, "quantum consciousness" as SITs act as a super-coolant, helping the brain to settle into states of minimal energy, lattices intact, coherent superposition in hydrophobic pockets stabilized. It is in the ability to be wholly focused as mind/body that the child and the artist/writer/mathematician/composer align in unified consciousness states. In fact, mark-making allows the adult mind, surrounded by distractions, to achieve the single-minded focus of the child so evident in play, including the play of scribbling and drawing, when the organism and the environment exist in harmonious synchrony.

Quantum Conclusion

Linguistic thinking in humans can be described as an over-layering of kinds of information from the sensory to the linguistic, with a major goal: settling into minimal energy states.³ In a brain which uses symbolic meaning to achieve such equilibrium, there must be motivation for such cooled-down states. We propose that the neurochemical rewards of the SEEKING and PLAY systems provide such emotional motivation.

SIX: HOW DOES THE QUALITY OF MATERNAL GAZE AND ATTENTION INFLUENCE THE CHILD'S BASIC ABILITY TO PAY ATTENTION?

The closing research question targets mother/child interactions around attention. To what degree does the mother's ability to pay attention to the infant and child determine the infant and child's ability to pay attention? How does the quality of maternal gaze influence the infant's ability to attend? Are there levels of attention, which the mother gives to the child and which the child

³Churchland, Patricia Smith. 1986, *Neurophilosophy*, Cambridge, Mass., MIT Press.

⁸⁰Penrose R, Hammeroff S., What 'Gaps'? Replay to Grush and Churchland. *Journal of Consciousness Studies* 1995; 2 (2):99-112.

learns to return to the mother and, thereafter, to use throughout life?^{84,85} This research should shed light on which elements in one-on-one interaction between mothers (and/or maternal substitute caregivers) and infants contribute to normal emotional, social and cognitive development.

The ability to pay attention is fundamental to survival. An organism orients toward nutrients and away from toxins. To do so, the organism must recognize nutrients and toxins. Recognition requires attention.

The thoughts of a person in shock or suffering trauma or finding herself in the throes of mental illness are scattered. That person is distracted. She can not pay attention. Her thoughts go everywhere... or remain stuck on one disturbing theme. Attention is the brain mechanism by which we control and organize our thoughts and our brain waves. Without attention, our brain waves go helter skelter. Like gravity, attention is an illusive, pervasive, comprehensive force in the TOE, or Theory of Everything, of mental health. Attention is at the heart of “mom” binding,⁷ and “time” binding,⁷³ the glue of social and time/space coherent experience. As mindfulness, attention is the portal to the experience of timeless unity, where everything is bound together, seamlessly. Both kinds of attentive consciousness - the time-full and the time-less - are necessary to effective, satisfying, illuminating thought and action over a lifetime.

The mother/child relationship, including shared gaze and directive, instructional attention, as well as mindful, non-directive attention, would not exist unless these qualities of attention were necessary to the mental/emotional well-being of mother and child. Shared gaze and shared attention are mutually therapeutic. Both mother and child thrive on shared attention. This “human” element in childcare is critical to the normal unfolding of the child. At the heart of this human experience is one-on-one attention --- the giving, the sharing, the learning of attention.

Research has shown that the temperament of the child influences the mother’s ability to care for the child. Difficult children are harder to bond with and attend to.⁸⁶ The importance of the child's potential contribution to parent/child interaction is considerable.⁸⁷ Child temperament also determines how susceptible a child is to parenting,⁸⁸ including responses to "maternal bids" for joint attention and communication. Autistic sons are often unaware of such bids.⁸⁹ Maternal

⁷Sheridan, S.R.. 2005. “A Theory of Marks and Mind: the effect of notional systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children,” *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable in on-site version at www.drawingwriting.com by permission by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page [att:http://www.sciencedirect.com/science/journal/03069877](http://www.sciencedirect.com/science/journal/03069877)

⁷³Marshack, A., 1991. *The Roots of Civilization*. New York: Moyer Bell Limited.

⁸⁴Landry, Susan H., Smith Karen E., Swank Paul R., Miller-Loncar Cynthia L., 2000. “Early Maternal and Child Influences on Children’s Later Independent Cognitive and Social Functioning.” *Child Development*. March/April 2000. Volume 71, Number 2, pages 358-373.

⁸⁵National Institutes of Health Clinical Center, study # NCT00361829, conducted 1988 - 2009, starting with children twenty months old. “The Influence of Maternal Age, Employment Status, and Parenthood Status on Children’s Cognitive Development.”

⁸⁶Brazelton, Barry T., 1992. *Touchpoints. The Essential Reference. Our Child’s Emotional and Behavioral Development*. Addison-Wesley Publishing House: Reading, MA.

⁸⁷Milliones, Jake. 1978. “Relationship between Perceived Child Temperament and Maternal Behaviors.” *Society for Research in Child Development*. Vol 49, No. 4(Dec. 1978), pp. 1255-1257.

⁸⁸Stright, Anne Dopkins; Gallagher, Kathleen Cranley; Kelly, Ken. 2008. “Infant Temperament Moderates Relations between Maternal Parenting in Early Childhood and Children’s Adjustment in First Grade.” *Child Development*, v.79, n1, p. 186-200. Jan-Feb 2008.

⁸⁹Adamson, Lauren B.; McArthur, Duncan; Markov, Yana; Dunbar, Barbara; Bakeman, Roger. 2001. “Autism and joint attention: Young children’s responses to maternal bids.” *Journal of Applied Developmental Psychology*. Vol. 22, issue 4, July-August 2001, Pages 439-453.

depression restricts the level of interaction between mother and child, to causing the child to expect less interaction from her during play sessions and to show less discomfort over this lack of engagement, even at two months of age, while demonstrating shorter attention spans for a larger number of objects because depressed mothers themselves initiate and terminate short attention spans to a range of objects.^{90,91} There is a direct relationship between the mother's attentional, social and didactic influence on the child and the child's ability to attend and to interact socially, as well to acquire and develop and express cognitive skills.^{84,85} If the mother's ability to pay attention to the child sets the stage for the development of social and cognitive skills, then maternal attention is a fundamental issue.

Research with four month-olds shows that human infant brains -- more than other primates -- specialize in recognizing gaze, frontally or even from the side. This ability to perceive face-to-face, directed gaze, including lifted eyebrows and smiles -- as cues to communication -- are "essential for infants' interactions with, and learning from, others."⁹² The human eye is unique in the size of its exposed sclera, or white areas, which surround a darker iris, creating the kind of light/dark pattern which provides a strong stimulus to the infant's immature visual system. Infants not only prefer to look at faces with open eyes, but they have a strong tendency to "attend to faces that engage them in mutual gaze when compared with averted gaze... It has been argued that an early sensitivity to eye gaze serves as a major foundation for later social skills. Indeed, an impairment of the sensitivity to eye gaze in general, and mutual gaze in particular, might be one of the early signs of a typical social development manifested in neurodevelopmental disorders such as autism."^{92,93,94}

Research with children with attention deficits and learning disabilities, including autistic children,^{93,94,95} underscores the importance of trained sustained (visual) attention, starting with a sensitivity to shared gaze. If the quality of the attention of the mother or other primary caregiver is critical to the normal development of this basic ability to attend and to recognize communication

⁸⁴Landry, Susan H., Smith Karen E., Swank Paul R., Miller-Loncar Cynthia L., 2000. "Early Maternal and Child Influences on Children's Later Independent Cognitive and Social Functioning." *Child Development*. March/April 2000. Volume 71, Number 2, pages 358-373.

⁸⁵National Institutes of Health Clinical Center, study # NCT00361829, conducted 1988 - 2009, starting with children twenty months old. "The Influence of Maternal Age, Employment Status, and Parenthood Status on Children's Cognitive Development."

⁹⁰Breznitz, Svia & Friedman, Sarah L., 1987. "Toddlers' Concentration: Does Maternal Depression Make a Difference?" *Journal of Child Psychology and Psychiatry*, Vol. 29, issue 3, pages 267-279, published online Dec. 6, 2007.

⁹¹Field, Tiffany, Nadel, Jacqueline, Hernandez-Reif, Maria, Diego, Miguel, Vera, Yanexy, Gil, Karla, Sanders, Chris. 2005. "Depressed mothers' infants show less negative affect during non-contingent interactions." *Infant Behavior and Development*. Volume 28, Issue 4, December 2005, pages 426-430

⁹²Grossman, Tobias, Johnson, Mark H., Lloyd-Fox, Sarah, Blasi, Anna, Deligianni, Fani, Elwell, Clare, and Csibra, Gergely. 2008. "Early cortical specialization for face-to-face communication in human infants." *Proceedings in Biological Sciences*. December 22:275(1653):2803-2811.

⁹³Phillips W., Baron-Cohen S., Rutter M. 1992. "The role of eye-contact in the detection of goals; evidence from normal toddlers, and children with autism or mental handicap." *Developmental Psychopathology*. 4:375-383.

⁹⁴Zwaigenbaum L., Bryson S., Rogers T., Roberts W., Brian J., Szatmari P., 2005. "Behavioral manifestation of autism in the first year of life." *International Journal of Developmental Neuroscience* .23:143-152.

⁹⁵Florence, Cheri L., 2007. "Teaching the Autistic Child to Pay Attention." [Http://www.articlesbase.com/diseases-and-conditions-articles/teaching-the-autistic-child-to-pay-attention-229241.html](http://www.articlesbase.com/diseases-and-conditions-articles/teaching-the-autistic-child-to-pay-attention-229241.html).

⁹⁶Young, Gregory S.; Merin, Noah; Rogers, Sally J.; Ozonoff, Sally. 2009. "Gaze Behavior and Affect at 6 Months: Predicting Clinical Outcomes and Language Development in Typically Developing Infants and Infants at Risk for Autism." *Developmental Science*, v.12 n.5 p.798-814 Sep. 2009.

cues in the infant brain and if such attention and recognition is the neurological bedrock for social and cognitive development thereafter, including the development of expressive language,⁹⁶ then we need to focus on, analyze, define and support the range of growth-promoting attentional cues provided by mothers and other primary caregivers.

An infant babbles, but he is taught/learns to speak. A toddler scribbles but he is taught/learns to write and read. An infant's eyes are drawn to lights and darks and edges, to open eyes, and to faces which offer an attentive gaze, but a child learns to attend. If there is no face to offer shared gaze, what happens to the visual/emotional development of the child? Evidently, something in the brain wiring of the actually or potentially autistic infant fails to respond to the maternal gaze.⁹⁶ In the cases of acquired autism, if "acquired" autism exists, the gaze shared between mothers and infants becomes of critical importance as an influence and as a predictor in terms of normal infant and child development.

The lighted screen does not provide maternal gaze. Parents need to know what stimuli are appropriate in terms of encouraging an infant's "amazing" capacities for alertness and attention.⁸⁶ If there is a supportive environment, the appropriate kinds and levels of attention will develop naturally between mother and child. Many mothers, for a host of reasons (often economic, and/or health-related), can not provide attentive gaze nor extended mother/child interaction. This absence or inability in the mother or primary caregiver to provide a loving gaze and other levels of instructional and/or directive and/or mindful attention has long-term consequences for the child in terms of the ability to attend as well as to expect attention.

In Dr. Sigmund Freud's practice as it developed over time, as well as in contemporary psychoanalytic practice supported by Buddhist meditation, a quality of nonjudgemental, mindfulness in the therapist is important to the the patient's ability to recover information and achieve understanding.⁹⁷ This mindfulness model is provided by mothers, too, as a non-interfering, yet attentive presence.⁹⁷ This quality of mindful attention - without franticness, without the distraction of multi-tasking, without any need for constant entertainment - is the kind of attention which the child needs, later, to flourish, from about the age of 4.⁸⁴ It is enough to be together in the sunshine while the child plays. From birth until about 3.5 years of age, the child needs shared gaze and directive, instructional attention. This is the optimum stage for introducing Scribbling/ Drawing/ Writing as a strategy for encouraging maternal/caregiver interaction around visual and

⁸⁴Landry, Susan H., Smith Karen E., Swank Paul R., Miller-Loncar Cynthia L., 2000. "Early Maternal and Child Influences on Children's Later Independent Cognitive and Social Functioning." *Child Development*. March/April 2000. Volume 71, Number 2, pages 358-373.

⁸⁶Brazelton, Barry T., 1992. *Touchpoints. The Essential Reference. Our Child's Emotional and Behavioral Development*. Addison-Wesley Publishing House: Reading, MA.

⁹³Phillips W., Baron-Cohen S., Rutter M. 1992. "The role of eye-contact in the detection of goals; evidence from normal toddlers, and children with autism or mental handicap." *Developmental Psychopathology*. 4:375-383.

⁹⁴Zwaigenbaum L., Bryson S., Rogers T., Roberts W., Brian J., Szatmari P., 2005. "Behavioral manifestation of autism in the first year of life." *International Journal of Developmental Neuroscience* .23:143-152.

⁹⁵Florence, Cheri L., 2007. "Teaching the Autistic Child to Pay Attention." [http://www/articlesbase.com/diseases-and-conditions-articles/teaching-the-autistic-child-to-pay-attention-229241.html](http://www.articlesbase.com/diseases-and-conditions-articles/teaching-the-autistic-child-to-pay-attention-229241.html).

⁹⁶Young, Gregory S.; Merin, Noah; Rogers, Sally J.; Ozonoff, Sally. 2009. "Gaze Behavior and Affect at 6 Months: Predicting Clinical Outcomes and Language Development in Typically Developing Infants and Infants at Risk for Autism." *Developmental Science*, v.12 n.5 p.798-814 Sep. 2009.

⁹⁷Epstein, Mark, 1995. *thoughts without a thinker*. Basic Books, Harper/Collins:NY.

verbal attention on a one-to-one basis in a consistent manner. After age 4, the open-ended, non-directive aspects of Scribbling/Drawing/Writing have attentional value, too.

We can revisit Dr. Jaak Panksepp's description of basic emotions, with a small change: PANIC, FEAR, RAGE, and attentive SEEKING. Feeling the emotion, attending to it, but not reacting to it is an important tenet of Buddhist psychotherapy.⁹⁷ The child who can recognize and identify her own PANIC, RAGE and FEAR but also learn to meet strong emotion with a non-reactive attentiveness will be able to move into the positive mind/body benefits of the SEEKING mode more easily. Again, the Scribbling/Drawing/Writing program promotes a committed, patient attentiveness which can be transferred to experience, teaching the child how to hold herself apart from destructive emotions. This kind of emotional coaching in childhood has important benefits in adult life and in society in general. Society benefits when people are capable emotionally.

The ability of the child to pay attention does not develop overnight. It grows from the moment the child is born. The mother reads the child's level of attention, attunes to it and encourages it, helping the infant's attention span to grow. The child learns to respond to different kinds of attention from the mother, from the less intense to the more intense, mirroring and matching these levels. Autistic brains experience mirror neuron dysfunction,⁹⁸ which interferes with the child's ability to receive and reflect other's emotions. Autism, includes attention deficits and mirroring deficits.

One of the simplest games invented to match and mirror and encourage and extend attention between mother and child is the game of Peek-a-Boo. The following Peek-a-Boo Principle underscores the importance of this attentional, lovingly emotional, increasingly language-based, give-and-take, call-and-response relationship between the mother and the child.

PREDICTION: The mother's/primary caregiver's ability to pay attention, to interact via shared mutual gaze with the infant and to provide didactic and social instruction throughout early childhood, determine (in general, with the exception of the diagnosed autistic child) the child's ability --- from early infancy --- to pay attention, to interact emotionally and to think. The social and mental abilities of the child as that child is influenced early in development by mothers and/or substitute caregivers in the context of the intuitive and intentional development of sustained attention, including the ability to delay gratification, provide important topics for longitudinal research.⁸⁵

⁹⁷Epstein, Mark, 1995. *thoughts without a thinker*. Basic Books, Harper/Collins:NY.

⁹⁸Dapretto, M., M.S. Davies, J.H. Pfeifer, A.A. Scott, Marian Sigman, Susan Y. Bookheimer, Marco Iacoboni. 2005. "Understanding emotions in others: mirror neuron dysfunction in children with autism." *Nature Publishing Group*. <http://www.nature.com/nnatureneuroscience>. 2006 - fil.ion.ucl.ac.uk

⁸⁵National Institutes of Health Clinical Center, study # NCT00361829, conducted 1988 - 2009, starting with children twenty months old. "The Influence of Maternal Age, Employment Status, and Parenthood Status on Children's Cognitive Development."

The Peek-a-Boo Principle

Peek-a-Boo

Female gorillas have been observed holding leaves up to their faces, then taking them away.⁷⁶ Infant gorillas do not, however, burst into laughter when their mothers do this. In fact, female gorillas do not hold leaves up to amuse their infants. They do it to hide. Presumably, they believe once the leaf is over their face, they cannot be seen because they cannot see. (This is akin to the Piagetian stage when the very little child believes that a toy, once hidden, is gone.)

The game of Peek-a-Boo springs, evidently, from primate behavior --- like pant-laughter, and vocal-gestural communication. In many instances, there is primate precedence for how we conduct ourselves as humans, for both good and bad.⁹⁹ Hominid mothers must have refined the leaf-in-front-of-the-face routine. Once infants started laughing at their mothers who were hiding behind leaves (pretending to hide?), the jig was up and the game of Peek-a-Boo was invented.

It is probable that hominid mothers and infants invented the game of Peek-a-Boo for several reasons:

- to re-establish closeness (since hairless Mom and helpless neonate could not cling together in undivided harmony as heretofore).
- to mutually entrain, as psychologists say, or to get “in sync,” via Peek-a-Boo and hilarity. The timing of the Peek-a-Boo interaction was geared by the mother to mesh with the infant’s attention span, but the timing was also designed to extend that span slightly, each time, readying the little brain, ultimately, for exchanges of words at speeds and pitches designed to be both attractive and comprehensible. Try playing Peek-a-Boo with a baby. Observe your own behavior. Aren’t you trying to extend the waiting time until you take your hands away a little bit later every time? You can call it suspense. I call it forcing an increase in the infant’s attention span.

“In the first weeks, a baby is learning to differentiate between important and unimportant sounds... By seven days of age, she will choose her mother’s voice from another female voice in a paired situation. By two weeks, she will choose her father’s voice... by three months, a baby will have learned an attention-inattention rhythm four times a minute. In the periodic attention, she will alert, vocalize and smile. When parents fit into this rhythm, she learns to imitate their vocalizations, facial movements and movements of their heads and bodies almost precisely.

“As adults fit into this pattern, they too will imitate the baby almost precisely. They will match her rhythms, inflection and motor behavior, as well as the attention-inattention rhythm. In

⁷⁶Falk, D., *Braindance*. New York: Henry Holt and Company, 1992/2003.

⁹⁹Sapolsky, Robert M. 2000. *A Primate’s Memoir*. Simon & Schuster: NY.

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the process, they are reinforcing her attempts at speech, as well as the rhythms that underlie later communication. As adults match the baby's behavior, they add a little extra onto it. The baby tries to live up to the slight added difference - to match it and to imitate them."⁸⁶

The familiar game of Peek-a-Boo provides a very powerful metaphor, or model, for describing a series of essential relationships: motion to growth, parent to child, drawing to writing and reading. All of these relationships demonstrate back-and-forth, call and response, dyadic interaction on biological, interpersonal, and inter-hemispheric levels, sharing the goal of incremental gains.

Mother and child are a dyad: a two-some. In this two-some game of Peek-a-Boo, mothers hide their faces with their hands, then, they remove their hands, calling out "Peek-a-Boo!" As the child loses sight of his mother, he searches for her, then, when the mother lowers her hands, the child catches sight of her face again. Finding mother's face elicits the infant's chortling belly-laugh. The baby is delighted/relieved! "Oh, thank goodness, Mom is still here!"

There are several reasons for this infant laughter:

- One is surprise. Surprise means having something happen to you which you did not think would happen: the term used to describe this situation is negated prediction. The child predicted when the mother covered her face that the mother had gone away. To the child's amazement, Mom is back!
- Another reason for infant laughter in the game of Peek-a-Boo must be the neurochemical kick built into recognition, rewarding the child for her ability to extract the face of her mother from the chaos of her young visual experience. The child recognizes her mother's face as a certain set of lines and shapes that "bind together" (the term used by people who study vision and consciousness). I call this "mom-binding".^{5,7} The first belly laugh of the infant celebrates this binding experience with the mother's face. That feeling of delight at recognition is repeated over and over again in the game of Peek-a-Boo, rewarding the infant's visual cortex via its emotional system for making sense of the environment.
- The child's laughter also enchants the mother, encouraging her to play the game again. The child is training the mother to help train its attentional system, using the eyes, or the visual cortex. The mother is tuning her hiding and self-revealing to the child's ability to pay attention. Instinctively, the mother lengthens the time it takes to remove her hands from her face, creating suspense, but, mainly, training the brain of the child to pay attention longer - in essence, to delay gratification. Learning to wait for a reward is one of the

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁷Sheridan, S.R.. 2005. "A Theory of Marks and Mind: the effect of notional systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children," *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable in on-site version at www.drawingwriting.com by permission by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page [att:http://www.sciencedirect.com/science/journal/03069877](http://www.sciencedirect.com/science/journal/03069877)

⁸⁶Brazelton, Barry T., 1992. *Touchpoints. The Essential Reference. Our Child's Emotional and Behavioral Development*. pps. 400-401. Addison-Wesley Publishing House: Reading, MA.

big lessons in life. Children are learning basic principles of human interaction from the game of Peek-a-Boo as call and response behavior; one person calls and the other responds to the call. This call and response-type behavior is the basis of conversation. It is also the basis for sympathy, and empathy.

Vision, attention, emotion, and dyadic exchanges are involved in the complex neurology of the game Peek-a-Boo. When the child starts to scribble, the child takes up self-training in all of these areas - vision, attention, emotion - with the new dyad being self and visible world, as well as self and the inner world of imagination and visualization. The child plays "Peek-a-Boo" with her brain; the bihemispheric brain plays Peek-a-Boo with its two lobes.

The dyadic interaction between parent and child trains the brain of the child for social life and mental life. The emotional tone established by the mother's response to the child in exchanges like Peek-a-Boo calibrates the emotional neurochemistry in the child's brain around future exchanges of meaning --- from conversations to interior dialogues --- in anticipation of positive, delightful responses, affecting the child's entire life as a social being, as well as a thinker. The child who plays Peek-a-Boo expects to be delighted by life.

Parenting and positive neuro-hormones

Bonding between mothers and babies occurs naturally. Neuro-hormones are responsible for this "natural" bonding. Oxytocin is involved. What about adoptive parents and other caregivers? Are there additional ways to bond via, say, dopaminergic/seratonic substitution? As caregivers, each of us can use closeness and meaning to cement our commitment to parenting. When human beings are feeling safe and close, serotonin is released, one of the feel-good transmitters. When humans are seeking the fruits of the earth, dopamine is at work, another feel-good neurotransmitter. Since marks of meaning are extensions of our SEEKING mechanisms, scribbling and drawing with young children are excellent ways to feel wonderful about parenting and caregiving in two ways: by bonding, releasing oxytocin and by seeking, releasing serotonin, and dopamine. This complex neurochemical brain infusion should hold true for "house husbands," too. Even though husbands and fathers do not reap the neurochemical rewards of pregnancy (increased spatial memory, as well as courage and flexibility under stress),¹⁰⁰ husbands and fathers will reap the rewards of bonding with small children, as well, as by scribbling, talking and drawing with them.

Given the neurochemical boosts provided by bonding and scribbling and drawing with children, it might also be true that the Scribbling/Drawing/Writing program would help alleviate post-partum depression. Research will provide answers.

Neurobeneficial parenting

If the learning environment is poor, the child's brain connections for learning will be poor. If the learning environment is rich, the child's brain connections for learning will be rich. Animal research has taught us that the word "rich" means the natural environment. The woods are a

¹⁰⁰Kinsley, C.H., Madonia L., Gifford G.W., Griffin G.R., Tereski K., Lowry C. et al. 1999. "Motherhood improves learning and memory." *Nature* 1999;402(11):137-8.

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rich learning environment for a fawn. Affectionate caregivers, conversation, support for mark-making and exposure to the variety and complexity of the natural world provide a rich learning environment for the child. Some of the brain connections a little child makes last a lifetime. Some are modifiable. Does this make neurobeneficial parenting scary? Well, parenting in the context of brain science is, at least, sobering. But parenting in ways that help infants and children's brain grow is important and, with books like this one, easily done!

The good news is that neurobeneficial parenting is mostly instinctive. The bad news is that there's been a cultural train wreck. Culture maintains that art and artists exist in a special category, while biology shows us that art is part of life.

Book Three in this series, *The Scribble Hypothesis*, outlines the biological research supporting art as the bedrock of early experience, early education, on-going experience and education, life in general for humans on informal, everyday levels.

Thirteen Brain-based Principles of Child Development

Brain Based Principles

These thirteen principles strongly support parental/caregiver interaction around marks of meaning. These principles are the distillation of 500 pages of comprehensive papers which I wrote when I began my doctorate in the late 1980's. The head of my dissertation committee told me to compress those 500 pages across seven categories of research into exactly 32 pages. I took that command as a constructive challenge, composing the following thirteen tenets of healthy brain-building:

1: *The brain builds itself.*

The brain builds neural assemblies. Some of the neural assemblies, like the ones for vision, are time-sensitive and become hard-wired. Some remain modifiable over a lifetime, like those for learning. The brain's neural assemblies are blueprinted by genetics and realized by experience. The brain's capacity for self-construction, integration and self-correction distinguishes these neural assemblies. Individual learning styles bring the brain's self-regulatory abilities into high relief. For individual learning styles to emerge, the learning environment must be flexible and rich, providing a range of sensory experiences, including visual, tactile and verbal exploration.

2: *Each brain is different.*

Each brain self-constructs, using inherited blueprints and experience. Although the blueprints for the wiring plan may be more or less alike in human brains, the wiring pattern of each brain is unique for several reasons: uniqueness results from the indeterminability of the exact path any neuron will take as it burrows through brain tissue; uniqueness is also the result of individual human experiences, especially with people and language.

Each brain has more neurons than the Milky Way has stars - hundreds of billions. As each neuron noses its way through brain tissue, "sniffing out" its proper site, a random function associated with the growth-cone insures the fact that no two brains are wired exactly the same, even in identical twins. This characteristic of the central nervous system is called "irreproducibility."^{101,102} The sheer number of neurons, along with the random function, creates individuality at the neural

¹⁰¹Changeux, Jean-Pierre, 1985. *Neuronal Man*. Oxford University Press:New York

¹⁰²Rosenfield, Israel. 1988. *The Invention of Memory*. Basic Books: New York.

level. Experience, including educational experience, creates individuality on a mental/emotional level thereafter. Each individual brain not only functions differently from every other brain, but, at any moment, that brain can change its own approaches to thinking, dramatically changing its own metabolic profile as well as its neural nets and their level of connectivity. The extraordinary point emphasized by this book is the degree to which the variability of the brain remains in the control of the learner for a lifetime.

3: *There are critical periods for brain growth.*

Just before birth, the brain makes more neurons than it needs. Soon after birth, the brain makes more connections than it needs. A continual rhythmic firing literally constructs the brain. Exuberant synaptogenesis subsides; connections are pruned in response to experience and learning. The brain's wiring systems for vision, language, attention, emotion, and motor skills stabilize. Many of the most significant connections are forged for life by the age of three.

Still, the brain's wiring remains modifiable for learning; but there is a catch: the feedback loop. The quality of the learning determines the quality of the wiring; the non-modifiable wiring systems determine the brain's future capabilities. If a baby is born with cataracts and they are not removed, the baby's ability to see as an adult will be limited. Because visual networks stabilize when children are young and because visual learning remains so important, the quality of children's visual stimulation at the pre-school and elementary levels of education is very important. Other early experiences persist, too, including attitudes about people and the world.

4: *The brain grows in stages.*

Some brain systems mature and stabilize before others can mature and stabilize. The timing between two interdependent systems is sometimes so close that several systems develop almost simultaneously. The exact timing or order of multiple maturations is indeterminable. No two brains grow in exactly the same way at the same time. Classroom expectations for developmental milestones must be flexible.

5: *Exploratory problem-solving helps the brain to grow.*

Physical exploration using all of the senses, particularly touch, encourages brain growth.

The more physically the brain approaches a problem, the more clearly formed and fully dimensional the solution to that problem will be. Exploratory problem-

¹⁰³Greenough, W T; Sirevaag A M. 1988. "A multivariate statistical summary of synaptic plasticity measures in rats exposed to complex social and individual environments." *Brain Research* 1988;444(1-2);386-92.

¹⁰⁴Greenough, WT. 1987. "What's special about development? Thoughts on the bases of experience-sensitive synaptic plasticity." *Developmental Psychology*. Academic Press: New York.

¹⁰⁵Sirevaag AM; Greenough WT. 1988. "Direct evidence that complex experience increases capillary branching and surface area in visual cortex in young rats." *Brain Research* 1988; 471(2):299-304.

solving not only streamlines neural assemblies,^{103,104,105} it also increases the production of myelin, the fast-axon insulator. A better wiring system for problem solving is pared-down, densely associative, and very fast.

6: *Feelings of control help the brain to grow.*

Feelings of well-being and brain growth correlate. A child who feels helpless and victimized may grow up with an underdeveloped limbic system. That adult may experience problems with controlling rage.

A sense of control encourages the growth of the limbic system which makes a broad range of controllable emotions possible. Caregiving strategies and educational strategies that play to children's strengths - like drawing - increase feelings of success and control.

7: *Experience effects the brain's potential and keeps modifying the brain for learning.*

Brains deprived of sufficient stimulation or abused by injury or trauma can be 20% to 30% smaller than average. The brain thrives on activity; it atrophies from disuse. An under-used or abused brain develops poorly and works poorly. For the human brain to grow, the body needs cuddling and play and the mind requires personal, direct, interesting conversation. Language experience is particularly important.

Experience modifies neural networks. Although many systems in the brain stabilize, becoming largely unmodifiable, neural changes in response to learning occur over a lifetime. It is possible to construct a better brain at any time. It is most effective to lay down patterns for effective thinking skills early in childhood, just as it is most effective to learn to ski, ride a bike or speak a foreign language when we are young.

As a self-correcting system, the brain can repair itself by using old areas in new ways, new areas in old ways, and new areas in new ways. Because of a phenomenon described as "neural drift," a functional brain area is able to infiltrate and remediate a dysfunctional area. This information is especially relevant for remedial education. A strength helps a weakness. For instance, left hemisphere damage is compensated for by right hemispheric strengths. By inference, the "drawing part" of the brain should be able to substitute for the "writing part". All students can take advantage of the brain's repairability and flexibility by determining their own special strengths through experimentation. To do so, the learning environment must be rich and flexible. Practice with multiple literacies provided cognitive richness. Then, students can use their strengths to their best advantage.

Severe early damage to the brain is irreparable, influencing the learner's ability to feel and control emotions and to store memories over a lifetime. This damaged mental profile characterizes many violent, repeat offenders.

8: Bodily experience helps the brain to construct mental maps including language.

Spatial understanding helps direct actions of the eyes, hands and feet. The geometry of physically experienced space becomes a frame of reference for the brain's sensorimotor maps. This spatial understanding precedes and undergirds multiple levels of linguistic understanding. Educators are apt to dichotomize non-linguistic and linguistic systems of representation - like art and language. Language systems are continuous with each other and depend upon each other for structure and information. The premise of this book is that effective writing skills depend upon effective drawing skills. Neural systems for representing meaning are scaffolded. This means that drawing, writing and mathematics are interconnected systems which can be taught integratively.

9: The brain is redundant.

Brains have more processing power than is necessary, making recovery from damage and compensation for damage possible. The fact that the brain is equipped with a margin for error insures its repairability, recoverability, and modifiability - in short, its resourcefulness.

10: Visual searches help the brain grow.

An innate predisposition for order is what I believe underlies Noam Chomsky's¹⁰⁶ and Stephen Pinker's¹⁰⁷ innate "language instinct". I describe this predisposition in my 1990 dissertation, and in Volume III of this series to come out in 2010. This predisposition for order is the true "deep grammar" which stimulates visual searches, on which the construction of verbal language rests. Visual searches organize the brain for language. Then, the "syntax of intelligent thought"¹ takes over. This spatial grammatical system extends itself to the brain's linguistic system. Exposure to language, then, triggers language.¹⁰⁸ After that, specific cultural codes or grammars for mother tongues become influential.

Without any training in visual searches, infants conduct visual/physical searches. The flailing of arms and legs and the instinctual motions of the eyes quickly become purposeful and informative. New information organizes the brain in new ways. Visual searches and brain growth constitute a feedback loop.

As the brain's visual system matures, the brain's ability to make distinctions sharpens. The visual system becomes adept at determining the edges of things. Once the brain is able to determine where one thing stops and another begins, the brain can make comparisons. By comparing and contrasting information, the brain winnows out similarities and differences, providing the bases for decisions,

¹⁰⁶Chomsky, N. "Human language and other semiotic systems." In: Sebeok TA, Sebeok J-U, editors. *Speaking of apes: a critical anthology of two-way communication with man*. New York: Plenum Press; 1980. p. 429-40.

¹⁰⁷Pinker, Steven, 1994 *The Language Instinct: How the Mind Creates Language*, New York: HarperPerennial.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

¹⁰⁸Sampson, Geoffrey. 1997. *Educating Eve: The "Language Instinct"* Debate. Cassell: London, New York.

opinions and conclusions.

The way the brain learns to conduct visual searches profoundly influences the brain's mental and emotional growth. The visual system, the emotional or limbic system and the ability to form attachments are interconnected. The early visual ability to make distinctions between light and dark, between edges of objects and surrounding space, lays the cognitive foundation for more general abilities, like recognizing a person's face as familiar or appealing, or, as the child matures, choosing between two compelling alternatives.

The act of drawing trains the brain's visual system to search for and to identify and to recognize distinctions, to make comparisons and, ultimately, to make value judgments between alternatives in preparation for forming intelligent attachments. This training establishes a grammar of intelligent thought, or a procedure for order.

11: *Storing memories in more than one way creates stronger, more accessible memories.*

The same information can be stored and accessed in different ways. A child can create and access information about an object - like a bird's wing - by drawing it, talking about it, writing about it, reading about it, dancing about it, remembering stories about it, making metaphors and similes, analogies, predictions and hypotheses about it. With this broad knowledge base in place, a child can access the bird's wing by selecting the mental directory labeled "bird" or "wing" via a host of other associations.

12: *Comparisons help the brain to organize and categorize, or recognize information.*

Some of the templates for comparison are determined by the senses. Spoken and written languages use the same kinds of strategies used by spatial information systems, including vision. "Saccades" (sah-cahds) describes the infinitesimal, back-and-forth scanning motion of the eyes. This scanning movement "refreshes" an image by re-stimulating the visual cells in the retina. On a mental level, saccades may provide the neural basis for comparing and contrasting information.

One thing may be darker or lighter than another, more or less defined at the edges, larger or smaller, stiller or more in motion. At linguistic levels, one object may be more or less important than another or more or less interesting. The deliberate use of comparative strategies including simile, metaphor and analogy, contribute to the grammar of intelligent thought. Comparative strategies can become saccade-like if they are practiced until they become automatic, including translations across systems of representation, like Drawing/Writing.

13: *Language is central to thought.*

Dynamic systems exhibit orderly behavior. Apparent chaos or messiness is an

aspect of highly organized systems and is an artifact of their complexity.

The brain is a dynamic system which executes numerous processes simultaneously. How the brain mobilizes organizational strategies determines the quality and usefulness of the information it stores. This book maintains that a systematic parts-to-whole, concrete to abstract, visual to verbal strategy for information processing is brain-like and teachable and describes this cumulative strategy as an orderly system, or “grammar of intelligent thought”. The five-step program outlined in *Drawing/Writing and the New Literacy*, 1997 and in *HandMade Marks*, 2009 and in *Saving Literacy*, 2009 demonstrates that this orderly mental system can be established through consistent training in an integrative cross-modal process called Scribbling/Drawing/Writing.

Symbol Grounding and Scribbling in the context of the work of Walter J. Freeman. Updating Neuroconstructive Theory.

Walter J. Freeman’s paper “The Physiology of Perception,” 2001, makes it clear that the shapes of an animal’s brain patterns indicating recognition become increasingly organized as circling, spiraling layers.² These non-symbolic patterns are very like children’s earliest circling scribbles. That observed similarity gave rise to my paper, “The Neurobiological Significance of Children’s Drawings: The Scribble Hypothesis,” 2002.⁵ Recently, Dr. Freeman’s 2009 paper, “The neurobiological infrastructure of natural computing: Intentionality”, provides further possibilities and support for my theories and practice.

In the context of Dr. Walter J. Freeman’s 2009 paper, “The neurobiological infrastructure of natural computing: Intentionality”,⁴ if the first elementary operators in natural computing vis a vis children’s thinking are fingers and toes, then Neuroconstructive theory proposes that the second level of elementary operators for natural computing are scribbling and drawing. In fact, the index finger is critical to holding a pen or pencil firmly, with precision; the index finger is our guide to pointing. The toddler uses that finger, along with the rest of his hand, to create his first point/dot/mark on paper, a gesture which will have enormous consequences for human symbolic thought. As Freeman observes, “The hand is the prime agency for symbolic representation... It is primarily through the hands that flow the execution of patterns created within the brain from stable networks.”⁴ “The Scribble Hypothesis”⁵ provides support for the position that the handmade patterns we call children’s scribbles and drawings help to create and generate patterns in the brain responsible for the stable networks from which symbolic thinking arises.

PROPOSITION: Neuroconstructive theory proposes - as it has since the late 1980’s in my comprehensive papers and in my 1990 dissertation - that scribbling and drawing operate as neural operators which create the spatiotemporal patterns which are necessary for symbolic thought. Freeman writes, “We can assert with

²Freeman, Walter J.; Broadhead, Peter. 1991. "The Philosophy of Perception." *Scientific America*, Feb. 11, 1991. pp 78-85.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

confidence that the categories and operations constituting symbols and symbol manipulation of natural computing require spatiotemporal patterning of neural activity as the basis for creating and manipulating symbols.”⁴ Neuroconstructive theory proposes that microscopic and mesoscopic and macroscopic recordings of electric and magnetic fields of potential in children’s gesturing, babbling, scribbling and drawing brains will reveal how children’s mark-making transforms itself from spontaneous operations into intentional symbols, shedding light on how the construction of a symbol “differs from an intentional non-symbolic act” (Freeman, 2009).

One of the contexts which “must be captured and used in discovering the nature of the difference in neural activity between a symbolic pattern and a non-symbolic pattern”⁴ are children’s earliest marks. Freeman observes that the issue is “how to describe the operators created by masses of neurons that direct the body to construct and manipulate symbols (those)... must have a “generic form of spatiotemporal patterns of neural activity that are closely related to the patterns of neural activity that... support and mediate the action-perception cycle in non-symbolic action”. Neuroconstructive theory proposes that one of these sets of generic forms of spatiotemporal patterns that support and mediate the action-perception cycle that moves from gesture to marks of meaning and thus, to symbolic action - as literacy - is children’s seminal marks, which are similar across time and culture. Neuroconstructive theory proposes that these seminal scribbles are responsible, along with the infant’s gestures and early babbling, for the neural activity which will, with time and natural unfolding and mentored support and training in speech, reading and writing (provided by mothers and other caregivers, including teachers), become symbolic reasoning, or thinking with words, numbers, musical notes, and other symbols.

In Walter J. Freeman’s 2009 paper, “The neurobiological infrastructure of natural computing: Intentionality”, he is searching for “koniocortex”, or that dust-fine distribution of cells in the human cortex “with no distinguishing architectural features, suggesting an all-purpose type of cortex” which, he hypothesizes, should function as “facilitators for higher-order organization of very wide synchronization of cerebral activity”. It is in this dense, fine, protected area of cortex that Freeman expects patterns of neural activity to arise which he calls AMH (amplitude modulation human) - patterns necessary for symbolic thought - which spring from more general spatial patterns of amplitude modulation (AM) and which occur when a brain is activating a portion of its knowledge base, say, in recognition. “Aha,” thinks the rabbit, “That is a carrot!”

PREDICTION: Neuroconstructive theory and the Scribbling/Drawing/Writing practice support the position that when children’s brains are scribbling in Middle

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

to High or Mature Stages and surely, when children are engaged in Early, Middle and High or Mature Drawing, their brain patterns will show a progression from AM patterns to the AMH patterns signaling symbol construction. Even more pronounced will be the sigmoid S-shaped curve wave heights (Freeman, "The Physiology of Perception", 2001) in both the generative neural AM perceptual patterns of Early Scribbling and in the full-blown AMH patterns when the child "writes" and "reads" her own marks of meaning (silently, internally and right-brainedly at first and audibly, externally, verbally, left-brainedly, later) as the child becomes more comfortable with speech, expounding on her very own scribbles and drawings with interest and enthusiasm and curiosity and discovery.

It is the intentional patterns that arise in children's scribbles after this initial state of focused arousal which point to the patterns which should identify where human thinking and creaturely intentional thinking diverge. This transition in scribbling and in the child's EEG's must be where the potential for human symbolic thought begins.

In my 1990 dissertation, "Drawing/Writing: a brain research-based writing program designed to develop descriptive, analytical and inferential thinking skills at the elementary school level", I proposed 13 brain-based recommendations for helping children's brains grow. Sustained attention and a range of symbols were critical to that brain growth, as well as the quality and timing of language-based experience, the importance of interesting visual searches, feelings of control and tasks that require cross-domain storage and construction (Sheridan, 1990, pps. 42-46). In the late 1980's, I was focused on the connections between drawing and writing. It took me another ten years to realize I needed to include scribbling. Freeman's 2001 paper, with its phase portraits of the brains of rabbits recognizing a smell, pushed my thinking toward scribbles because scribbles and phase portraits of perception as recognition are isomorphic; they map onto each other.

Over the first few years of a child's life, the patterns generated by children's scribbles and drawings become increasingly organized, varied, and complex. Spirals become mazes. Euclidean geometry emerges. "Combines" and "Aggregates"²⁹ appear.

The scribbling/drawing hand is a motor organizer for these increasingly complex, nested and overlaid "landscapes"⁴ or space phase/ "sandwiches,"^{3,1} and they indicate - and, in fact, generate - a special order of cortical, intentional neural operations within, presumably, the koniocortex and thus have global distribution or influence.

Early scribbles - a hodge podge of lines and dots - are not symbols, yet, but

²⁹Kellogg, Rhoda, *Analyzing Children's Art*, figures on pages 14, 49, 56, 101, and 109 © 1969, 1970 by Rhoda Kellogg. Reprinted by permission of McGraw-Hill Companies, Inc.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

³Churchland, Patricia Smith. 1986, *Neurophilosophy*, Cambridge, Mass., MIT Press.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

they are dynamic operations, early evidence of what will become intentional chaotic organizers on a symbolic level.

PROPOSITION: A child's earliest circling scribbles act as neural operations, or pattern generators, or Strange Attractors,⁵ which will direct/organize/tune up the body/brain to make symbols. I feel strongly that symbols first arise from the internal geometry of intentional thought itself and that the babbling, scribbling child intuitively, motorically, sensitively and sensibly, accesses an internal, perceptual neural geometry shared by all creatures who make meaning of their environments and that children are peculiarly able, because of their prehensile hands and larger, cooler (human) brains, to make those intentional perceptual geometries visible to their own eyes using a crayon or a marker and then to elaborate upon these neural geometries, using a crayon or a marker. Dr. Freeman's 2009 theory⁴ on general AM patterns of perceptual arousal shared across creaturely brain patterns supports this position (Sheridan, 1990 and thereafter).

The visible geometry that arises first in children's mark-making is the child's first true symbolic language. Arithmetic thinking comes much later, preceded by a kind of analogic, algebraic thinking, expressed in simile and metaphor by the child at about age three. In the Neuroconstructive continuum, children's early mark-making captures the internal geometry of neural brain activity, which then gives rise, through more nested scribbling and embedded drawing, to algebraic/analogical thinking as visual patterns and as verbal simile and metaphor. It is proto-analogical and algebraic thinking in the child after this that can become the formal use of algebra and arithmetic by the child.

The linguistic constructions for relationships and comparisons based on sameness and difference precede and imply and require algebra. This means that the algorithms for analogy are embedded in the koniocortex, either inherent or potential which are stirred up and organized by the child's babbling tongue and scribbling hand.

The operations of arithmetic - again - are implied by and embedded in simile and metaphor, in analogy, in algebra and in the algebraic phrases a child generates, in the complex figures the hand creates by adding, subtracting, multiplying, dividing shapes into more shapes, less shapes, new shapes. This combinatorial, computational mark-making uses the same rules as the child's strings of spoken language. **The child elaborates the structure and grammar of verbal relationships using visual marks.** The "language instinct"¹⁰⁷ is based on an instinct for Euclidean and non-Euclidean geometry. Scribbles show that the child's brain waves and thus her scribbles are Riemannian, first, and Euclidean, second.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

¹⁰⁷Pinker, Steven, 1994. *The Language Instinct: How the Mind Creates Language*, New York: HarperPerennial.

The child's elaborated geometries - Euclidean, non-Euclidean, Riemannian - become the building blocks of the marks-based, multiple literacies available to the human mind: drawing, writing, algebra, calculus, geometry, art, music, and physics.

QUESTION: Can we accept the idea that children's scribbles and drawings are operators of natural computing which form symbolic categories under intention and both create and depend upon Hebbian nerve cell networks which are key because they "access nonconvergent (chaotic) attractor which regulates spatio-temporal pattern of cortical activity"?⁴ As creators of Hebbian nerve cell networks, scribbles and drawings must operate as a collection of attractors, forming an "attractor landscape," or "space phase sandwich".^{1,5} The child's drawings of Euclidean and non-Euclidean shapes demonstrate the existence of attractor landscapes and hierarchies of nested landscapes within the child's koniocortex.

"The basin of attraction is defined by the cumulative set of coactivated sensory receptors on all past experiences. The process constitutes inductive logic: forming a category by repeated sampling of many-to-one convergent dynamics. The categories are inferred to correspond to forms that exist in the environment" and confirmation of these categories or hypothesis receives "neurochemically mediated reinforcement".⁴ I propose that children's scribbles create and confirm these neurochemically rewarded categories which exist in the environment of the child's mental/motor world.

In addition, my research as a teacher and as a scholar, supports the idea that sustained attention using marks of meaning, including scribbling and drawing, and writing and reading across symbol systems, receives positive emotional/chemical reinforcement because such thinking conserves energy by creating order, allowing greater outputs than inputs and by resolution, or the settling of the thinking system into minimal energy states^{1,5,6,7,8} as a decision or a solution or a completed work (of art, say, or music) is achieved by the child or the adult.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁶Sheridan, S.R. 2004. "Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness," *Toward a Science of Consciousness*, Tucson, abstract #209.

⁷Sheridan, S.R.. 2005. "A Theory of Marks and Mind: the effect of notional systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children," *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable in on-site version at www.drawingwriting.com by permission by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page [att:http://www.sciencedirect.com/science/journal/03069877](http://www.sciencedirect.com/science/journal/03069877)

⁸Sheridan S.R.. 2006. "Glossolalia, Consciousness states, and the mind/body benefits of fluent spiritual speech: Extending the purpose of linguistic experience." www.drawingwriting.com. Poster session, abstract 300, sixth Toward a Science of Consciousness Conference. University of Tucson, Tucson Arizona. Downloadable www.drawingwriting.com

PREDICTION: Dr. Freeman sees a discontinuity as crucial to the phase transition necessary for symbolic thought. Neuroconstructive theory predicts that mark-making, as it moves from Early to Middle scribbling, provides a discontinuous bump in energy.^{5,6,7} When children's scribbles are examined by neurobiologists and physicists, these transitional, "bump" marks will emerge as important, early neural events in "the complex topology of attractor landscapes in the insulated neocortices that accompany performance of the most elementary arithmetic (and other symbolic) operations" (Freeman, 2009, p. 9). Parenthetical comment added by Sheridan. In terms of "The Scribble Hypothesis," 2002, and its postulated SIT's, these moments of intense self-induced transparency provide radically discontinuous bumps in phase transitions and, thus, in consciousness states on the level of symbolic thought.

Proposed research experiment

A test could be made with aplysia and a rat pup and/or a rabbit and a human child to determine the contours and boundaries of shared and unshared neural geometries of perception/recognition, or the neurodynamics of intentionality. When aplysia reaches for nutrients, when a rabbit smells a carrot, when the infant recognizes his mother's face for the first time and bursts into laughter, how do the sigmoid S-curves of brain activity compare in terms of amplitude and periodicity? The space phase sandwiches,^{1,5,6,7} or tensor transformations,^{3,109,110,111} or Freeman's recorded neural "landscapes" must change.

What happens to the brain activity in young children as babbles turn to words and as scribbles transform themselves into intentional mark-making? What is going on in the koniocortex? What is going on, brain-wide? What happens in the limbic system? In the hyperthalamus? In the planum temporale? The child's ability to selectively and sustainedly attend because of his own mark-making must affect brain waves' amplitude, shape, speed, synchronicity. Marks continue to engage the eye and brain of the child until the child stops making marks and then, still, the child can look at the marks, talk about them, think some more about them, go back to them and elaborate on them - just as writers, composers, scientists do. How many marks were necessary for Einstein to be able to write, at last, $E=MC^2$ squared? How much symbolic thought?

¹Sheridan, S.R. 1990. "Drawing/Writing: a brain-based writing program designed to develop descriptive analytical and inferential thinking skills at the elementary school level." UMASS School of Education doctoral dissertation.

⁵Sheridan, S.R. "The Neurological Significance of Children's Drawings: The Scribble Hypothesis." *Journal of Visual Literacy* 2002; 22(2): 107-128. Sheridan, S.R. 2002.

⁶Sheridan, S.R. 2004 "Scribbles: The missing link in a bio-evolutionary theory of language with implications for human consciousness," Toward a Science of Consciousness, Tucson, abstract #209.

⁷Sheridan, S.R.. 2005. "A Theory of Marks and Mind: the effect of notional systems on hominid brain evolution and child development with an emphasis on exchanges between mothers and children," *Medical Hypotheses Journal*, V64(2):417-427. This article is downloadable in on-site version at www.drawingwriting.com by permission by Elsevier. Hypertext link to Medical Hypotheses ScienceDirect Page [att:http://www.sciencedirect.com/science/journal/03069877](http://www.sciencedirect.com/science/journal/03069877)

³Churchland, Patricia Smith. 1986, *Neurophilosophy*, Cambridge, Mass., MIT Press.

¹⁰⁹Llinás, Rodolfo R., 1986, unpublished paper, given to Sheridan, late 1980's.

¹¹⁰Llinás, Rodolfo R., 2001. *I of the Vortex: From Neurons to Self*. Cambridge, MA:MIT Press.

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Neuroconstructivism in the context of Walter J. Freeman: Summary

The taxonomy of scribbles and drawings recorded by Rhoda Kellogg and Sylvia Fein and organized in the books *Saving Literacy*, and *HandMade Marks* (Sheridan, 2009), provide an observable, empirical set of body/brain behaviors which, I believe, prepare the brain for pre, proto- and fully realized symbolic thought. Literacy, or more precisely, multiple literacies (the reading and writing of images, words, mathematical and musical symbols) share one wellspring: the progression of universal, unambiguous, increasingly intentional, handmade marks enacted by the child. Brain scans (MRI's and EEG's) across biological systems, including other mammals and infant humans through literate young adults, should support this position. A child's scribbles and drawings are different from other creatures' trails or marks and a human child's brain patterns change as her mark-making becomes more intentional.

Neuroconstructive theory proposes that human brain tissue, brain activity and meaningful marks and sounds developed together to allow humans to speak and to write and read. Children babble, then learn to speak. Children scribble, then learn to write and read. The fundamental computational wiring is in place in Freeman's AM brain waves of shared creaturely recognition.

EXPECTATION: Supported by Dr. Freeman's work (2009), Neuroconstructivist theory would expect that the human (amplitude modulation) patterns that serve as the foundational neural substrate or preliminary operators for symbol construction, change when children begin to babble and scribble, starting to show signs of what Dr. Freeman calls the AMH patterns (amplitude modulation human) - patterns which will differ from the non-symbolic perceptual creaturely AM patterns. On the other hand, Neuroconstructive theory would not support the position that the AMH patterns (of human brain patterns for symbolic thought) "cannot be directly involved with implementation of motor-sensory-perceptual processes, as are the more concrete activity designated as AM patterns" (Freeman, 2009). We believe scribbles are directly involved in the motor-sensory-perceptual processes necessary to human symbolic thought.

Neuroconstructive theory proposes that human mark-making (along with directed, human speech) is responsible for human AMH brain patterns for symbolic thought, or thinking using images, words, numbers, musical notes and other symbols - as the spoon relates to batter in the baking of a cake. As the spoon dips into the bowl of batter, it encounters a mass of ingredients. Similarly, scribbles dip into the ingredients of AM brain patterns of creaturely perception in the brain. As the spoon changes the composition of the ingredients in the batter, so scribbling changes AM patterns, stirring them into tighter, ever more orderly, more coherent AMH patterns. AMH patterns (the patterns of symbolic thought) both arise in and drive scribbling and drawing in young children, letting them access and influence that special, dense, sequestered, quieter area of the cortex which Dr. Freeman has labeled the koniocortex, identifying that area as the place where symbolic reasoning arises and is refined.

Neuroconstructive theory proposes that handmade marks are part of the child's repertoire of natural language, in line with Dr. Freeman's position that, "AMH patterns may be close kin to and perhaps indistinguishable from the elements of natural language as the neural commands (as Freeman's computations or as Sheridan's "deep spacial grammar") that produce spoken and written words. The central hypothesis of this essay (Freeman's 2009 essay) is that natural computation emerges and evolves from intentional action... The development is unique to humans beyond the most rudimentary capabilities for subsymbolic operations in non-human species... related to some unique structures and functions (of) human neocortex... collections of neurons... beyond the micro-meso-macro designations."⁴ Neuroconstructive theory fully supports this position, agreeing that there is brain tissue beyond the current designations and that tenets #5 and #6 of the Scribble Hypothesis, along with its attempt at a quantum position, hint at the extraordinary, entirely discontinuous, "jumped-up" operations the human mind can achieve using marks of meaning, including translations across systems of representations, and epiphanic/enlightening/break-through SIT's, or events/experiences of Self-Induced Transparency.

The human brain is uniquely self-organizing for AMH patterns through the multi-modal potential of infant brain tissue¹¹² and through embedded neural cues like the hertz rate of the infant planum temporale.^{49,50,112,113,114,115} These special tissues and neural cues for speech and literacy are first evidenced in the wave forms of babbling and scribbling. "The step in brain dynamics that goes beyond categorizing inputs from a collection of objects or events in creating a symbol of a category that has no objects or events" (Freeman, 2009) is glimpsed and then realized through the unfolding of children's marks of meaning.

Freeman observes (2009), "An obvious location... for AMH pattern signs is in the convexities of the frontal, parietal and temporal lobes," and that natural computation probably arises in neocortex near Broca's and Wernickes areas, as well as "in the motor, premotor, and parietal areas that control the digits of the hand... The symbol-generating cortices may require as yet unknown neurodynamical properties. Hence I (Walter Freeman) suggest using the histological term

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

¹¹²Holowka S., & Petitto L.A. Left Hemisphere Cerebral Specialization for Babies While Babbling. *Science* 2002; 297: 1515.

⁴⁹Petitto, L.A., Zatorre, R.J., Gauna, K., Nikelski, E.J., Dostie, D., & Evans, A. C. 2000. "Speech-like cerebral activity in profoundly deaf people while processing signed languages: Implications for the neural basis of all human language." *Proceedings of the National Academy of Sciences*, vol 97, 25, 13961-13966.

⁵⁰Petitto, L. A., 2000. "On the biological foundations of human language." In K. Emmorey and H. Lane (Eds.) *The Signs of Language Revisited: An anthology in honor of Ursula Bellugi and Edward Klima*. Mahwah, N.J.: LEA, pp. 447-471.

¹¹³Katanode, K, Yoshikawa K, Sugishita M. 2001. "A functional MRI study on the neural substrates for writing." *Human Brain Map* 2001 May;13(1):34-42. Kawamura M, Midorikawa A, Kezuka M. 2000. "Cerebral localization of the center for reading and writing music." *NeuroReport* 2000;11(14):3299-3303.

¹¹⁴Lesser R.P., Lueders H., Dinner D.S., Hahn J., Cohen L., "The location of speech and writing functions in the frontal language area. Results of extraoperative cortical stimulation". *Brain* 1984 Mar;107(Pt 1):275-91.

¹¹⁵Nakada T., Fujii Y., Yoneoka Y., Kwee I.L., "Planum temporale: where spoken and written language meet". *Eur. Neurol.* 2001;46(3):121-5.

koniocortex.”

Neuroconstructive theory proposes that areas of neocortex dedicated to fundamental “heart beats” of fetal and infant activity like the planum temporale, as well as Broca’s and Wernicke’s language areas and the sensory/motor areas devoted to fingers and the tongue are all involved as organizers in the koniocortex. Quantum effects of babbling and scribbling - as these generative, communicative activities prepare and organize the human brain for intentional symbolic reasoning - were and are so important that they receive and merit encouraging, self-sustaining neurochemical rewards (the neurochemical rewards described in Panksepp as outcomes of SEEKING and PLAY), setting up a feedback loop between the quantum effects of SIT’s (ecstatic states of self-induced transparency) and infant laughter, the three year old’s metaphor and similes and pleasing and meaningful scribbles and drawings. This feedback loop becomes extremely powerful in writers, artists, musicians, mathematicians and theoretical neurobiologists!

Closing Comment

If Freeman’s statement is correct:⁴ “The brain is an open system with respect to energy and information but a closed system with respect to meaning. Its unity is inviolate” (2009), then - because dynamic systems are continuous across creation - the universe must be both open and closed, too, and so must our brains and their relationship to language (as both innate and learned). The universe, the brain, and the nature of language learning are unified dualities.

Can we ever tease apart these relationships? Do we need to? As in the case of gravity, the as yet unresolved 4th force, we will forever have mysteries to understand about the relationship of brain to mind to language and literacy. We do not have to understand everything to embark upon the journey of marks and mind, starting with scribbles - anymore than we have to understand everything about a person to love him or to love her. Existence, language, love - none is strictly reducible.

Every symbol system is approximate. No single system - not drawing, nor writing, nor painting, not mathematics, nor even music - has the entire answer to any question. Still, several symbol systems, including translations across symbol systems, will bring us closer to a fuller understanding.

That is why the human mind devised multiple literacies.

⁴Freeman, Walter J.; March 2009. "The Neurological Infrastructure of Natural Computing: Intentionality." Kozna, R., Caulfield, H.J. (Eds.), Singapore: *World Scientific*.

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