BrainStream:
The Brain in the Mainstream

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We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

Through the unknown, unremembered gate
When the last of earth left to discover
Is that which was the beginning;

At the source of the longest river
The voice of the hidden waterfall
And the children in the apple-tree
Not known, because not looked for

But heard, half-heard, in the stillness
Between two waves of the sea.

Quick now, here, now, always —
A condition of complete simplicity
(Costing not less than everything)

And all shall be well and
All manner of thing shall be well
When the tongues of flame are in-folded
Into the crowned knot of fire
And the fire and the rose are one.

Little Gidding
(fourth poem of the *Four Quartets*)
T. S. Eliot

I begin my composition with this closing fragment of T.S. Eliot's masterpiece, *Little Gidding*, fourth poem in the *Four Quartets*. I know I can count on its ability to eloquently elicit profound inner mystery—silence and awe. I frequently experience these qualities during my journeys into the science and literature of Interpersonal Neurobiology, as well as when I make my attempts to communicate what I have learned to innocent acquaintances. If you choose, I predict that you too can explore yourself and your own personal neurobiological responses to the richly ambiguous language of T.S. Eliot's poetry.

In that state of mind, I invite you to wander in the forest of burgeoning ideas about the mind. I would like to begin by drawing your attention to the pregnant edge of expectant emptiness: 1997. An article written by James Gorman appeared in the *New York Times,* on April 29, 1997. It is entitled *Consciousness Studies: From Stream to Flood.* This article is entirely empty of the type of technical specificity that so characterizes neuroscience articles in 2005-6. It does, however, point the 1997 reader to the mountains of statistics that summarized then current understandings: *The Cognitive Neurosicences* (MIT Press,1,447 pages), which cost $95 and weighed 8 pounds! The author is clearly anticipating a forthcoming flood of scientific discoveries into the biological roots of subjective experience.

http://query.nytimes.com/gst/fullpage.html?sec=health&res=990CE7DD1231F93AA15757C0A961958260

Less than 9 years later, the *New York Times* is presenting its readers with numerous articles that document a ceaseless flow of discoveries about the biology of consciousness and other matters, both detailed and philosophical. For example, on March 30, 2006, Nicholas Wade wrote a *New York Times* article entitled *Scans Show Different Growth for Intelligent Brains*, wherein they report

> *changes in the thickness of the cerebral cortex, the thin sheet of neurons that clads the outer surface of the brain and is the seat of many higher mental processes.*

... The general pattern of maturation, they report in Nature today, is that the cortex grows thicker as the child ages and then thins out. The cause of the changes is unknown, because the imaging process cannot see down to the level of individual neurons.

But basically the brain seems to be rewiring itself as it matures, with the thinning of the cortex reflecting a pruning of redundant connections.

The analysis was started to check out a finding by Dr. Thompson: that parts of the frontal lobe of the cortex are larger in people with high IQ's. Looking at highly intelligent 7-year-olds, the researchers said they were surprised to find that the cortex was thinner than in a comparison group of children of average intelligence

http://www.nytimes.com/2006/03/30/science/30brain.html?ex=1157860800&en=0b9563c96d30bd0a&ei=5070

Just recently, the use of fMRI scans was widely reported in the news media, and reopened the controversy about the nature of life and potential for consciousness that subsists within a person in a "persistent vegetative state." The *New York Times* reported:

A severely brain-damaged woman in an unresponsive, vegetative state showed clear signs on brain imaging tests that she was aware of herself and her surroundings, researchers are reporting today, in a finding that could have far-reaching consequences for how unconscious patients are cared for and how their conditions are diagnosed.

http://www.nytimes.com/2006/09/08/science/08brain.html?_r=1&ref=health&oref=slogin

Of the same patient and same fMRI scans, *Science* Magazine reported:

We used functional magnetic resonance imaging to demonstrate preserved conscious awareness in a patient fulfilling the criteria for a diagnosis of vegetative state. When asked to imagine playing tennis or moving around her home, the patient activated predicted cortical areas in a manner indistinguishable from that of healthy volunteers.

http://www.sciencemag.org/cgi/content/abstract/313/5792/1402

In another area of web-based media, researchers are reporting in *Nature* that specific areas of the brain have been identified which themselves function to categorize images and idetic memories:

Socks in the sock drawer, shirts in the shirt drawer, the time-honored lessons of helping organize one's clothes learned in youth. But what parts of the brain are used to encode such categories as socks, shirts or any other item, and how does such learning take place?

New research from Harvard Medical School (HMS) investigators has identified an area of the brain where such memories are found. They report in the advanced online Nature that they have identified neurons that assist in categorizing visual stimuli. They found that the activity of neurons in a part of the brain called the parietal cortex encode the category, or meaning, of familiar visual images and that brain activity patterns changed dramatically as a result of learning. Their results suggest that categories are encoded by the activity of individual neurons (brain cells) and that the parietal cortex is a part of the brain circuitry that learns and recognizes the meaning of the things that we see.

"It was previously unknown that parietal cortex activity would show such dramatic changes as a result of learning new categories," says lead author David Freedman, PhD, HMS postdoctoral research fellow in neurobiology. "Some areas of the brain, particularly the frontal and temporal lobes, have been associated

with visual categorization. Since these brain areas are all interconnected, an important next step will be to determine their relative roles in the categorization process.

http://www.eurekalert.org/pub_releases/2006-08/hms-eii082306.php

Found in the *Los Angeles Times* book review, September 3, 2006, a review of Stephen Kuusisto's book: *Eavesdropping: A Memoir of Blindness and Listening*, W. W. Norton.

STEPHEN KUUSISTO has John Milton's gift. "The soul's path," he claims to have learned from the blind poet, "is in the ear — not in the mirror." Kuusisto's blindness is not complete: He is able to see "colors and torn geometries." "Blindness for me was veil after veil of forest colors," he writes. "But what a thrill it was to be a sightless child in a city of sounds."

As a disabled child, Kuusisto (whose name means "grove of spruce" in Finnish) often found himself on the margins, a blessing that allowed him long — albeit often lonely — hours in nature. "Writers are all orphans of a kind," he writes. "But I learned my listening early. Knew the cicadas from the katydids. Knew starlings from grackles." He remembers sitting among spruce trees as a child, listening to the clicking of crows' beaks: "Dry old wood in a dry climate. Sound of an old man's knees…. The sound of oars along the Nile…. First sound of ancestor worship."

... "When the sighted look you over," he says of a man whose scrutiny he senses, "it feels like you've walked into a ghost in the woods." ... In Fenway Park, he overhears two fans on acid describe Pedro Martinez, then pitcher for the Boston Red Sox, who "sheds strands of iridescence: long moonglow strings of light as he throws."

This is writing that enriches the reader's life by heightening the reader's senses. Amazing to be reminded that flat, stolid letters on a page can actually course through one's veins, can cause the synapses in one's brain to transmit their hopeful message: There's more! There's more! There's so much more than meets the eye!

http://www.calendarlive.com/books/bookreview/cl-bk-discoveries3sep03,0,2802310.story?coll=cl-bookreview

With this, we circle back to the beginning where neurobiology and subjective experience intersect, stunning us with the mystery of how neural firings in the brain unfold the sometimes almost unbearable richness of our daily lives.

Food for Thought

Antonio Damasio's Three Laws

Law #1: The body precedes the mind.
Law #2: Emotions precede feelings.
Law #3: Concepts precede words.

http://www.usc.edu/schools/college/news/2005january/damasios.html
http://www.edge.org/q2004/q04_print1.html#damasio

Jeff says: "I'm a poet, a good pastry chef, a supervising spiritual director at Mount Saint Mary's College Spirituality Center in Los Angeles, a Registered Nurse with a Masters degree in Comprehensive Health Planning from UCLA, and Bachelors degree in History from UC Berkeley, an ex-Peace Corps Volunteer in the Marshall Islands (public health), and a ex-Army Medic who served two years in a surgical intensive care unit, US Army Hospital, Camp Zama, Japan. I love photography, dream work, choral music, the Enneagram, travel, and adult transformational spirituality."