

Synthetic is More Sensuous: Advances in Neurology and the Aesthetics of New Media

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Powerful new techniques, fMRI, magnetic encephalography, recordings from neuronal ensembles, visualizations of neuronal growth, and neuro-chemical analyses are elucidating brain/mind functioning — the process of experience. These techniques prosthetically extend us across technological platforms, shift our preferences to the synthetic, and our purely human evolution to human/machine evolution.¹ For instance, Nicolelis uses implanted electrodes in volitional cortical motor neuron ensembles to enable control of a mouse cursor, or a robot, from thought alone.² Similarly, audio recordings from implanted electrodes in rat brains, extend Matt Wilson's sensorium, enabling him to "listen in" on rats' dreams.³

Brain evolution is a form of neuroplasticity, as are memory and individual brain development. In the fetus neurons proliferate, migrate into place and make an overabundance of synaptic connections. Used connections are selected and unused synapses are pruned. V.S. Ramachandran theorizes that aberrantly remaining (unpruned) cross-modal connections between the color and adjacent number area in the brain causes synesthesia, and furthermore that creativity results from a richness of unpruned cross-modal connections forming a high capacity for metaphor.^{4,5}

Paradoxically, memories are unstable during recollection. After removing a memory from storage, the brain reconsolidates it into stable form. Re-storage depends on protein synthesis which, if manipulated, alters the memory (thus explaining the ease of implanting false memories).^{6,7} Different forms of memory are organized distinctively in the brain, i.e. declarative (language based) and non-declarative (procedural/skill based) memory, episodic (personal experiences) and semantic (learned facts) memory, spatial memory, etc.⁸

Mirror neurons, cortical neuron systems that fire both during one's performance of an action, or expression of emotion, and during the observation of another enacting these, form the basis of empathy and art appreciation. Understanding what others feel occurs by the inner

imitation of the observed action or expression. The representation is matched to an existing representation and used to modulate emotional experience. Empathic individuals exhibit unconscious mimicry of other's postures, mannerisms, and facial expressions more than non-empathic individuals.⁹

How consciousness is integrated into a stream of coherent experiences is called the binding problem. Neuroscientists hypothesize that two brain/mind systems control the stream of consciousness, the thalamocortical axis and the prefrontal cortex (PFC). Nearly all information from the sense organs passes through the thalamus. The thalamic reticular nucleus (TRN) generates most of the internal activation of the cortex modulating its gates in "burst firing" or continuous (tonic) firing mode. In tonic mode, the simultaneous firing of broad neuronal populations leads to neuronal synchrony, triggering looping activation in cortical circuits, and amplifying one loop over others in a recursive process. Interacting re-entry loops reinforce and compete with each other, with the dominant loop(s) becoming conscious. The PFC integrates consciousness by controlling the focus of attention, picking the winner of the looping competition set up by the thalamus and updating representations in working memory.^{10,11,12}

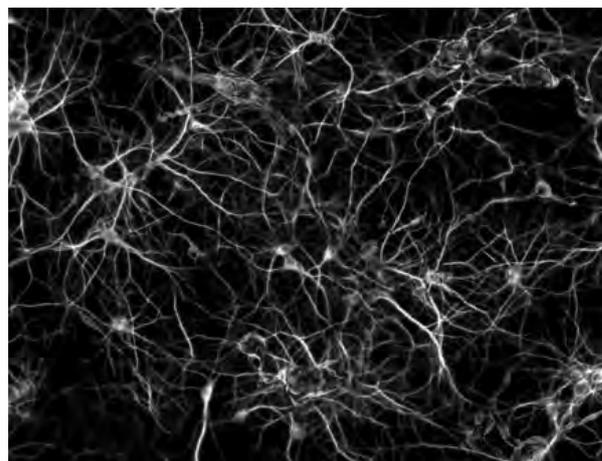
The process of experience, brain/mind functioning, is the most important subject of contemporary art; it is native for new media art. Certain neuroscience experiments designed to study the competition for consciousness and others which manipulate memory are structurally similar to *Walks* by the artist Janet Cardiff. In *Walks*, the viewer, while instructed to follow a prescribed path, receives audiovisual input related to the current environment, the past environment, as if the speaker is present, or is somewhere else. Streams of sensory stimuli loop, magnify, cancel, conflict — competing for which one will become conscious or will reconfigure, confuse or implant a memory.¹³

If a computer network had a consciousness what would it be like? This is the subject of Ben Rubin's *Listening*

Post, David Rokeby's *n-Chant*, and Lynn Hershman's *Dina*. *Listening Post* is a curved wall grid of screens displaying text culled from 100,000 internet chat room users, mixing synthesized voice and other sounds in six looping movements (the first beginning with the text "I am..."), creating a recursively evolving conscious "surface" to the internet.¹⁴ In *n-Chant* each of the [n] numbers of computers arranged in a network suspended from the ceiling, speaks English sentences in its own voice. In the undisturbed equilibrium resting state they chant with each other. A visitor speaking into a microphone disrupts the coherent chanting and the "state of mind" shifts until the equilibrium reemerges.¹⁵ *Dina*, a bot, is a consciousness represented on a screen as woman's lip-synched face. Through artificial intelligence software (bolstered by internet searches) she converses with the viewer.¹⁶

In the DVD *Placebo* Saskia Olde Wolbers uses an intimate first person stream of consciousness narrative voiceover to evoke individuals existing in a fluid mental space, enclosed worlds where fantasy, reality, real and false memories are blurred together. The video imagery (scaleless interior/exterior landscapes) is startlingly reminiscent of the neuronal architecture of the brain — networked treelike forms evoke dendrites, straight bundles evoke tubular axonal white matter connections and budding bubbles crossing small gaps evoke synaptic transmissions.¹⁷

Thomas Struth's museum pictures, whose subject is mirror neuron systems, show the critical role of inner imitation and motor enactment for empathy and art appreciation.¹⁸



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The photographed visitors eerily align themselves in shapes reflecting both the images they view and their contexts. Struth's photographs, too, represent his own consciousness as it mirrors the consciousness of the artist who created the depicted work.

Cory Archangel replaces "unalterable" computer game chips with chips he burned himself with an altered game/graphics code. These hacked games explore silicon and neuronal plasticity in memory and learning; the fixed game chip is modified, "learning" to be a new game. He transformed *Super Mario Brothers* into *Super Mario Clouds* by deleting all but the clouds and the shooting game *Hogan's Alley* to *I Shot Andy Warhol* by replacing the generic targets with images of Pope John II, Flavor Flav, and Andy Warhol.¹⁹

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3 Wilson, Matt, interviewed. Radiolab episode, "Sleep". <http://www.wnyc.org/shows/radiolab/episodes/2007/05/25>

4 LeDoux, Joseph. 2002. *Synaptic Self*. New York: Penguin.

5 Ramachandran, V.S. 2004. *A Brief Tour of Human Consciousness*. New York: PI Press.

6 Kandel, Eric. 2003. "The Molecular Biology of Memory Storage." In *Nobel Lectures in Physiology or Medicine 1996-2000*. Hans Jornvall (Editor), Singapore: World Scientific.

7 LeDoux

8 LeDoux

9 Carr, Laurie, et al. 2003. "Neural Mechanisms of Empathy in Humans", *PNAS*, <http://www.pnas.org/cgi/reprint/100/9/5497.pdf>

10 Granger, Richard H. and Hearn, Robert A. 2007. "Models of thalamocortical system". *Scholarpedia* 2(11):1796. http://www.scholarpedia.org/article/Models_of_thalamocortical_system

11 Tononi, Giulio and Edelman, Gerald M. 1998. "Consciousness and Complexity." In *Science* 282, December 4.

12 Maia, Tiago V. and Cleeremans, Axel. 2005. "Consciousness: converging insights from connectionist modeling and neuroscience." In *TRENDS in Cognitive Sciences* 9 (8), August.

13 Cardiff, Janet. <http://www.cardiffmiller.com/artworks/walks/index.html>

14 Rubin, Ben. <http://www.earstudio.com/projects/listeningpost.html>

15 Rokeby, David. <http://homepage.mac.com/davidrokeby/nchant.html>

16 Hershman, Lynn. <http://www.lynnhershman.com/>

17 Olbers, Saskia. <http://www.drawnbyreality.info/saskia.html>

18 Stafford, Barbara. 2007. *Echo Objects*. Chicago: University of Chicago Press.

19 Arcangel, Cory. <http://www.beigerecords.com/cory/tags/artwork/>