The Psychopathologies of Cognitive Capitalism: Part one

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Published on the occasion of *The Psychopathologies of Cognitive Capitalism: Part Two* at ICI Berlin, this book collects the papers that were presented during the first part of the conference in Los Angeles in November 2012. This volume is the first of a series of books that attempts to broaden the definition of cognitive capitalism in terms of the scope of its material relations especially as it relates to the conditions of mind and brain in our new world of advanced telecommunication, data mining and social relations. It is our hope to first improve awareness of its most repressive characteristics and secondly to produce an arsenal of discursive practices with which to combat it.

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Neuropower: Art in the Age of Cognitive Capitalism

> A closer look shows that while on the one hand there has been a reduction in machine-commanded time separate from the worker's body, on the other hand there has been an explosive increase in the linguistic-communicative-relational time of living labor, the time that in the New Economy involves inter-subjective communication or value–creating cooperation.[1]

Neuropower constitutes the new focus of biopower to administer difference and sculpt a homogenous people. It consists of three key ideas. First and foremost, neurpower acts upon the neural plastic potential of the brain in a living present, especially during what is referred to as the critical periods of development, all the while being guided by the desire to produce a conscripted and enrolled individual of the future. Secondly, it redirects the armamentarium of power from a focus on distributions of sensations in the natural and designed world to the distributions

[1] Christian Marazzi, *Capital and Language: From the New Economy to the War Economy* (Los Angeles: Semiotext(e), 2008), 54.

of the working memory, which are called up in the process of making future decisions.[2, 3] Thirdly, neuropower is the latest stage of an ontogenic process beginning with the disciplinary society, as outlined by Michel Foucault, followed by the society of control, as developed by Gilles Deleuze, and proceeding towards Maurizio Lazzarato's noo-politics.[4, 5, 6]

After a discussion of two concurrent complementary theories of developmental neurobiology, Neural Darwinsim and Neural Constructivism, each of which attempts to script out the ways and means that the experience of the world is inscribed in the neural network architectures of the brain, I propose to map out a theory of art production that competes for a limited neural space with the hegemonic triumpharate of cognitive capitalism: sovereignty, spectacular culture elaborated through creative software programs like After Affects and CAD, and cognitive neuroscience, in particular consumer neuroscience.

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[2] "I call the distribution of the sensible the system of self-evident facts of sense perception that simultaneously discloses the existence of something in common and the delimitations that define the respective parts and positions within it. […] The distribution of the sensible reveals who can have a share in what is common to the community based on what they do and on the time and space in which this activity is performed. Having a particular 'occupation' thereby determines the ability or inability to take charge of what is common to the community; it defines what is visible or not in a common space, endowed with a common language, etc." Jacques Rancière, *The Politics of Aesthetics* (New York and London: Continuum, 2004), 12-13.

[3] The primary visual cortex is located in the occipital lobe of the brain and is the initial site in the cerebral cortex where information streams originating in the retina of the eye are processed.

[4] Gilles Deleuze, "Postscript on the Societies of Control," in *October* 59 (Winter 1992): 3-7.

To conclude, I want to use a question posed by Walter Benjamin in *Illuminations*—how might human sense perception change with humanity's entire mode of existence?—as a way to approach the underlying conditions of the conference "The Psychopathologies of Cognitive Capitalism." Could the effect of the late Roman art industry and the Vienna Genesis, which (as Benjamin states) "developed not only an art different from that antiquity but also a new kind of perception" be a model with which to understand the effect of information technologies upon our society and ourselves today?[7] Could it be that they instigate "new kinds of perception"? Moreover, might these changes bring about new cognitive dispositions as well? Could these new epistemological tools build new forms of thought and understanding, in addition to misunderstandings, confusions and misinterpretations? Could the new tools, apparatuses, forms of sociability and networking in the information age, in smooth time and space, and in their internalized mental forms, destabilize the foundations of the neural architectures of the brain constructed

[5] *Ibid.*, 3-7. The passage from the disciplinary society to the society of control and noo-politics, that is to say the administration in the closed and wide-open spaces, previously focused on the condition of the individual and the dividual in relation to the past and the present. They described the focus of power as that which organized the interruptions and undulation of flows of time and space in the disciplinary society and society of control, respectively, in the context of a "present condition of the now," even if, for instance, in the society of control Deleuze suggests future kinds of gadgets of control, such as an "electronic card that raises a given barrier."

[6] Maurizio Lazzarato, "Life and the Living in the Societies of Control," in *Deleuze and the Social*, eds. Martin Fuglsang and Bent Meier Sørensen (Edinburgh: Edinburgh University Press, 2006), 186.

[7] Walter Benjamin, *Illuminations: Essays and Reflections*, ed. Hannah Arendt (New York: Schocken Books, 1987), 222.

through an interaction with modernist repetitive spaces and regulated organized time? Could these new smooth forms of time and space regulated by Rheimian and Einsteinian algorhythms instead of Euclidian and Newtonian equations in fact prompt a re-sampling and consequent remapping of the brain's genetically prescibed diverse population of pre-suppositions and pre-perceptions, ultimately reconfiguring the forms and images that are associated in ephemeral, emerging neural network configurations and the thoughts they elicit?

These questions echo propositions highlighted by Gilles Deleuze's review of Gilbert Simondon's *L'individu et sa genèse physico-biologique*[8]: namely, that these new reroutings of neural energies might, as a result of different weighted valencies, and based as they are upon intensive patterns of cultural saliency rather then extensive ones, stake out stable network territories in degenerate networks, thus reconfiguring meaning and understanding anew. I would like to consider the causes of the psychopathologies of cognitive capitalism, for example of panic disorders and attention deficit disorder, beyond those of overstimulation and feeble attention, and look at them instead as the leftovers of the incomplete process of the normalization of the plasticity of the brain and the imperfect instruction and superimposition of the real and imaginary upon the frontal lobes of the brain.

[8] "Doubtless this is because he does not restrict himself to the biological determination of individuation, but determines increasingly complex levels of individuation; thus there is a properly psychical individuation that arises precisely when the vital functions are not sufficient to resolve the problems posed to the living, and when a new charge of preindividual reality is mobilized within a new problematic, within a new process of solution (cf. a very interesting theory of affect). In its turn, the psychic opens upon a "transindividual collective." Gilles Deleuze, "Review of Gilbert Simondon's *L'individu et sa genèse physico-biologique (1966)*," in *Pli: The Warwick Journal of Philosophy* 12 (2001): 43-49.

The Intimacy of Neuropower and Neuroplasticity: The Para-Psychology of the Financialization of Capital

First and foremost, neuropower acts upon the neural plastic potential of the brain in a living present, especially during what are referred to as the critical periods of development, all the time being guided by the desire to produce a conscripted and enrolled individual of the future.[9] Critical periods are temporal windows in which the nervous system is especially sensitive to the effects of the environment mediated, for the most part, by parental influences early in life through a process described by the great Russian psychologist L.S. Vigotsky as the internalization or the internal reconstruction of a formerly external activity.[10] The acquisition of language is a case in point and is internally reconstructed and coupled to a process called epigenesis, in which even local cultural influences can play an important role in sculpting the pluripotential of the brain.

Epigenesis is defined as the means through which the unfolding of the genetically prescribed formation of the brain is altered by its experiences with the environment whether that be the milieu of the brain itself or the world. Neural plasticity delineates the means through which the components of the brain—that is, its neurons, their axons, dendrites, synapses and neural networks (refered to as its firmware)—, in addition to its dynamic signatures, like temporal binding, allow distant parts of the brain to communicate and be modified by experience.

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[9] Warren Neidich, *Lost Between the Extensivity/Intensivity Exchange* (Eindhoven: Onomatopee 25, 2009), 65-69.

[10] Lev S.Vygotsky, *Mind in Society* (Cambridge, MA: Harvard University Press, 1978), 56.

As Christian Marrazzi quoting Felice Cimatti states "the environment of the human animal is language itself; the human animal is adapted to language, is made for and by language."[11] For instance, the immature brain has the capability of learning over 6,700 different language variations, even if it chooses to learn one or a few. The Japanese child growing up in London can learn English perfectly without the trace of an accent, in the same way that the English child growing up in Tokyo can learn Japanese. Each child is subjected to very different language environments reflecting very different scripted enactments between themselves and their parents acting as agents for their culture with very different results. Once the journey to a specific language acquisition is underway, other languages are closed off to perception. Six months after learning Japanese, the English R is imperceptible to the Japanese speaker.[12]

[11] Marazzi, *Capital and Language*, 30.

[12] "Human infants have special cognitive abilities that are built for exactly this cultural variation. For example, in the realm of vowel sounds, infants of just six months have been shown to restructure their auditory space according to the local language: the space becomes systematically and irreversibly distorted. […] The end result is a range of spectacular biases in our auditory perception, which make adults unable to even hear the difference between sounds that are fundamentally distinct in some other language." Stephen C. Levinson, "Introduction: The Evolution of Culture in a Microcosm," in *Evolution and Culture,* eds. Stephen C. Levinson and Pierre Jaisson (Cambridge, MA: MIT Press, 2006), 14. Note that the words "cultural variation" are used to refer to language learning.

[13] "The essential feature of the cerebral organization, which may explain the genesis of subjective experience—not only sensory perception and what is commonly called thinking, but also feelings and emotions—is the architecture of the brain's cellular and molecular network and the activities that occur with this network. Developed over the course of biological evolution, and established during embryogenesis and postnatal development, this neuronal architecture supports capacities that are peculiar to the human species and allow it to learn, to store information, and to test truthfulness of the knowledge it has acquired..." Jean-Pierre Changeux, *The Physiology of Truth* (Cambridge, MA: Harvard University Press, 2004), 9.

Man used to lived in nature, which provided the stimuli and experiences to alter brain's architecture.[13] Today, as more and more people move to the designed spaces of the city, it is culture, as it is inscribed in the designed space of the urban environement, that sculpts what is referred to as the neural plasticity of the brain. Language in the form of street signs, kiosks, billboards (painted, audiovisual, and banners), as well as new conscripted forms of information found in the infosphere on the internet, mobile phones and their apps, tablets and so forth, play an important ancillary role in this neural sculpting, in particular when they are coupled to historical cultural markers. "Agencies of repression were used to force the conscious organisms to submit to the State's rhythm without rebellion. Now political domination is internalized and indistinguishable from the machine itself. [...] In the biosocial age, the machine is informational: an internalized process of linguistic modeling, logic and cognitive automatisms."[14]

The Normalized Subject in Future Memory

Neuropower redirects the armamentarium of power from a focus upon distributions of sensations (as elaborated by Jacques Rancière), with its concomitant forms of bottom-up processing through which abstract concepts are built from concrete sensation, to one that is focusing on top-down processing. Abstract concepts centered in the forebrain and pre-frontal cortex modulate future actions and behaviors by affecting the downstream sensorial and perceptual systems to which the brain is connected. These abstract concepts are formed in the working memory.

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[14] Franco "Bifo" Berardi, *After the Future* (Oakland, CA: AK Press, 2011), 23.

Today, it can be advanced that mechanisms or apparatuses of power have increasingly found ways to intervene in the working memory, and do so through the rearrangement of its contents. The working memory refers to long- and short-term memories called up and held briefly in the mind, assembled for the accomplishment of a particular task to be achieved in the future. Important in this regard are the conditions of new forms of machinic intelligence and competence in the age of immaterial labor, alongside a notion of general intelligence prescribed by tertiary economies in which worker-communication and decision-making in the face of competing laboring options are encouraged.

The frontal lobe is essential, for instance, in what is referred to as free-choice situations, according to which one must decide how to interpret an ambiguous situation. "Dealing with inherent ambiguity is among the foremost functions of the frontal lobes. In a sense, whether you are decisive or wishy-washy depends on how well your frontal lobes work. Studies have shown that patients with frontal lobe damage approach inherently ambiguous situations differently from the way healthy people do. The loss of the ability to make decisions is among the most commons signs of early dementia. Damage to other parts of the brain does not seem to affect these processes."[15] In this regard the new focus of power is not only on the false reproduction of the past—analogous to manipulating an archive; the effects of power have moved to the reconstitution of the working memory, elaborated by the forebrain in implicit decision-making processes utilized to form a plan or make a product choice. In other words, the new territory of neuropower is not past memory but *future memory*.

[15] Elkonon Goldberg, *The Executive Brain: Frontal Lobes in a Complex World* (New York: Oxford University Press, 2001), 79.

Can the new burgeoning fields of consumer neuroscience, in which decision-making areas of the brain are probed in order to provide information concerning how product designers might intervene in the working memory itself, provide the new apparatuses of cognitive capitalism? In other words, is it possible for marketers to bypass the conditions of the distributions of sensibility and directly activate areas such as *nucleas acambens* in the ventral striatum to affect choice and decisions?[16]

In light of these questions, the recent success of the film *Inception* (2010) may very well be understood as a response to our collective anxieties about the possibility of memory espionage and lack of free choice. Is resistance futile? These frontal lobes as opposed to the senses are the new focus of power. *Mutatis mutandi*, they thus constitute a new object for the theory of power. While acknowledging the importance of the theories of Rancière, some of which are built upon here—specifically his ideas describing the distribution of the sensible, its policing and the artist's role in rearranging it—I would nonetheless like to note the diminished role that such an analytic may play in the future. Instead, I call for the deep understanding of the development of a designed post-phenomenology, in which sensation and perception are bypassed. It advances that it is the intervention in the re-organization of working memory during the production of a plan—and *not* straightforwardly memory itself—that constitutes the new site of administration.

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[16] Mirja Hubert and Peter Kenning, "A current overview of consumer neuroscience," *Journal of Consumer Behavior*, Volume 7 (2008), 272-292.

From Noopolitics to Neuropower

Neuropower is the latest stage of an ontogenic process beginning with the disciplinary society, as outlined by Michel Foucault, followed by the society of control as developed by Gilles Deleuze and proceeding onward to Maurizio Lazzarato's noo-politics. He defines noo-politics as "the ensemble of techniques of control that is exercised on the brain. It involves above all attention, and is aimed at the control of memory and its virtual power."[17]

Neuropower distinguishes itself from noopolitics in two important ways. First, it is not about the modulation of the attentive networks in the real present cultural milieu. Instead, it is about the rerouting of the long-term memories into working memory according to gradiants of intensive affective flows, energy sinks, phase transitions, basins of attraction and stochastic and random resonances. This is the key to its link to the performative conditions of labor in the new economy. The machinic intelligence is not in the apparatuses of production as they once existed in the assembly-line of factories. Rather, it is within us as contemplative circuits mimicking the flows of new labor. Secondly, neuropower is not about the production of a real object. Instead, it is exerted through a modification in the neurosynaptologics of the brain. In cognitive capitalism, neuropower works to produce changes in the material logics of the brain by affecting the brain's neurons and synapses—its firmware—as well as its dynamic properties such as binding and reentry.

[17] Lazzarato, "Life and Living," 186.

Each epoch as it is defined, for instance, by new forms of social, political, economic, psychological and technological relations, requires new forms of dispositifs to administer the people. Think for the moment how differently the regimes of Fordist labor and Post-Fordist labor necessitate and script different styles of architecture. "Where modern architecture was informed through the logics of industrialization, including mass production, mass standardization, and a Fordist attitude to the workforce, parametric architecture is now informed through computation, customization, individuation, and a post-Fordist attitude to the work place."[18] Architecture is a mirror through which we can reflect upon the changes in the culturally inflected landscape of designed space, and of individuation and subjectivity as well. For it is proposed here that the brain is analogously changed by the same generational and epochal relations that modify architecture, design, the plastic arts, literature and so on and so forth. The condition of the brain/mind condition, as they are embedded in this sea of generational cultural changes, as well as the cultural memory that results from this, reflects these changes as analogously scripted changes in the brain's modifiable plastic tissue.

Such an account is, however, not to be interpreted as crudely positivist and linear; on the contrary, the process is full of bushwacking and backtracking. There are examples that show the extent to which the disciplinary society is still important today, although the human eye may have been replaced by the surveillance camera and the time schedule opened up to a more spontaneous and individual kind of daily planning. Moreover, one can discover traces of neuropower in the past, such as the brainwashing role of the Catholic, Jewish and Islamic religions in the early eduction of their followers' children.

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[18] Ingeborg M. Rocker, "Apropos Parametricism: If, In What Style Should We Build?" *Log* 21, Winter (2011), 92.

In the new information economy-charactized as it is by semio-capitalism, in which the production of objects has been superseded by the production of psychic effects and new powerful tools such as software agents that trace our choices and calibrate the level of our desire, the ability of neuropower to map institutional paradigms upon the materiality of the wet, mutable organic surface of the brain itself is being realized. According to this gamble, new labor as it journeys closer to becoming performance, even as praxis and poetics merge, does in fact leave a trace. More on this later.

The Other Side of Neuropower

The present text does not afford me the opportunity or space to expound on the variety of political outcomes of neuropower. Instead, I would like to elucidate some of the above concerns through an explanation of the other side of neuropower. Similar to what Michael Hardt and Antonio Negri have contributed in their complexification of biopower, we must also consider that there exists another side to neuropower.[19] The role of art production as a means to counterbalance and challenge this power of the sovereign in the age of neoliberal global capitalism—especially in the latter's transitions into neoliberal cognitive capitalism, in which the labor of thought itself provides, on a global scale, the new territory for capitalistic

[19] "The general right to control its own movement is the multitude's ultimate demand for global citizenship. This demand is radical insofar as it challenges the fundamental apparatus of imperial control over the production and life of the multitude. Global citizenship is the multitude's power to reappropriate control over space and thus to design the new cartography." Michael Hardt and Antonio Negri, *Empire* (Cambridge, MA: Harvard University Press, 2000), 400.

adventurism—will form the subtext to what follows, keeping in mind the subsumption of artistic production as a model for Post-Fordist labor recently elucidated by Luc Boltanski and Eve Chiapello in *The New Spirit of Capitalism* and Pascal Gielen's *The Murmering of the Artistic Multitude*.[20, 21] It is my contention that artistic practice, through its direct and indirect effect upon the cultural field deforms or elaborates upon its displaying of cultural memory in an existential and meta-existential way.

In the case of institutional design and architecture, for instance, artistic practice mutates built space and thus changes its ability to act as a platform for organizing human attention. This is especially true in our attention economy, where what is dispayed most intensely and most often is what we tend to remember. This rerouting of attention according to a system of other rules and syntagma produces other paradigms of truth that have the potential to activate and resonate with other non-institutionally contrived combinations of variable neural pre-representation with different results.[22]

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[20] Luc Boltanski and Eve Chiapello, *The New Spirit of Capitalism* (London: Verso, 2005), 419-482.

[21] Pascal Gielen, *The Murmuring of the Artistic Multitude: Global Art, Memory, and Post-Fordism* (Amsterdam: Valiz, 2009), 24-25.

[22] "These changes are the result of genetically delineated spontaneous activity which generates a variable host of what are referred to as pre-representations upon which environmental stimulation is superimposed through resonance. A precise matching of evoked and endogenous activity leads to increase synaptic strength and selective storage." Jean-Pierre Changeux, *Physiology*, 61.

In its most utopian guise, it can emancipate the virtual contingencies locked up in the pluripotentiality of the pre-individual self, itself a result of the tremendous variation of the neurobiologic substrate, producing a multiplicity of inter-subjective difference and heterogeneity rather than a homogenous people. In other words, I would like to challenge the idea of immaterial labor and suggest that cognitive labor —both affective and symbolic—produces real changes as modifications in the neurosynaptologics of the brain in the form of long term and short term memories.[23, 24]

To understand the true emancipating power of art in our moment of cognitive capitalism, we must understand it in its neuromodulating capacity. In the next section, I would like to lay the groundwork for this argument by delineating two complementary theories through which artistic objects, events, and experiences might leave a trace.[25] Two important aspects of noise "music" give us a unique opportunity to do this. First of all, noise as a disruptor of resonance and synchronicity has immediate affects upon the symbolic and the affective through a process of delinking cultural available networks of sensations from their corresponding neural correlates in the present. Second, noise as a transgenerational modifier. Using the example of John Cage's now famous *4'33"*, I would like to script out the ontogeny of how a disdained and incomprehensible form of sound art has recently been embraced by a new generation of musicians and listeners.

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[23] Dave Beech, *Art and Value*, Historical Materialism Book Series, forthcoming (personal communication).

[24] Sean Sayers, "The Concept of Labor: Marx and His Critics," in *Science and Society*, Vol. 71, Number 4 (October 2007): 431-454.

[25] I use the word "event" here after Alain Badiou.

The Neural Constructivist/Neural Darwinism Linkage Model

> There were leaders who knew better, who would have liked to deal. But they were trapped. Conservative talkers on Fox and talk radio had whipped the Republican voting base into such a frenzy that deal-making was rendered impossible. How do you negotiate with somebody who wants to murder your grandmother? Or—more exactly—with somebody whom your voters have been persuaded to believe wants to murder their grandmother? I've been on a soapbox for months now about the harm that our overheated talk is doing to us. Yes it mobilizes supporters—but by mobilizing them with hysterical accusations and pseudo-information, overheated talk has made it impossible for representatives to represent and elected leaders to lead.[26]

But how is the development of brain and mind linked to the history of objects, abstract knowledge, and to the production of the subject in the context of neoliberal cognitive capitalism with its emphasis on immaterial labor and knowledge industries? In order to formulate a theory of resistance, one must address the conditions of this all-pervasive system. In what follows, I would like to use ideas emanating from two sources that propose very different theories about how the process of environmentally directed neuromodulation—what we have been calling epigenesis—takes place.

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[26] Tobin Harshaw, "Can 'No' Revive the Republicans?" in *The New York Times*, (March 26, 2010).

First, I shall engage the Theory of Neuronal Group Selection or Neural Darwinism as formulated by Gerald Edelman; then, I will turn to an exposition of the Theory of Neural Constructivism as formulated by Steven R. Quartz and Terrence J. Sejnowski.[27, 28] I shall argue that these ideas, often considered contradictory, can be understood as complementary. Together, they can help shed light on the new contingencies of cognitive capitalism.

Edelman's theory and that of Quartz and Sejnowksi ask a basic question: what are the determinants of neural development both intrauterine and post-natal? Is it, as Neural Darwinism would suggest, an unfolding of a prescribed neurobiological process, in which a stochastic, intrinsically non-deterministic, genetically contrived exuberant growth of neural elements is followed by a period of epigenetic pruning and regression called apoptosis or programmed cell death? A process in which, through a Darwinian survival-of-the-fittest paradigm, a seemingly chaotic overabundance of neural elements becomes sculpted by various constant and pervasive environmental contingencies into a finely tuned sensorial-perceptual-cognitive machine? This theory has the benefit of parsimony and mimics in certain ways the concrete genetic and immunological systems already in place.

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[27] Gerald Edelman, *The Remembered Present* (New York: Basic Books Inc., 1989), 44-49.

[28] Steven R. Quartz and Terrence J. Sejnowski, "The Neural Basis of Cognitive Development: A Constructivist Manifesto," *Brain Sciences*, 1997, 14-17.

According to Quartz and Sejnowski, the weakness of this theory lies in its dependence on the notion of prespecification.

The theory necessitates, for instance, that the network must build in the problem of the diversity of the world domain *a priori*. They contend that the world that human beings live in is constantly changing and, even though neural Darwinism might work in a laboratory where all the conditions can be specified, the real world is in flux. Genetically prescribed variability can never live up to the task of coding for the ever-changing conditions of the world-picture or cinema. Neural constructivism proposes that instead of simply a regression of neural elements after their period of exuberant growth, development is rather "a progressive increase in the structures underlying representational complexity" and these changes depend on an "interaction with a structured environment to guide development."[29] Furthermore, "dendritic development fulfills important requirements for a non-stationary learning mechanism, suggesting how dendritic development under the influence of environmentally derived activity conforms to schemes for the construction of mental representations."

This answers the problem of concept drift. The statistical properties of the target variable, which the model is trying to predict, change over time in unforeseen ways. This causes problems because the predictions become less accurate as time passes. The Theory of Neural Constructivism can adjust to these changes, whereas Neural Darwinism can not.[30]

[29] *Ibid*, 6.

[30] *Ibid*, 6.

In other words, in a changing cultural environment, such as one defined now by intensive rather than extensive milieus, a constructivist organized brain can be modified according to the mutating conditions it confronts with a concomitant mutation of itself.[31]

For the present argument, it is important to understand that neither theory has complete hegemony in the realms of speculative and theoretical developmental neurobiology. We should think instead of how each model or theory might help us elucidate the mechanism through which nature or designed space plays an important role in the production of corresponding neural architecture to be used in thought. Of importance for us here is that both these theories agree on the significance of the environment in sculpting or scripting the neural plastic potential of the brain.

The theory of neuronal group selection, the hallmark of neural Darwinism, is made up of three components. Simply stated, there is the primary repertoire that is a product of developmental selection; the secondary repertoire that is produced by experiential selection; and reentry which stabilizes and elaborates upon the secondary repertoire.

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[31] Could that be one explanation for the now-accepted theories of distributed networks and gradients as models for brain organization having replaced hierarchical organization and grandmother neuron theories? Yes, we have conceptual tools for understanding new forms of organization through our experience with the conditions of the internet and world wide web. Neuroscientific explanations have always profited from technological models like the steam engine, hologram and computer to guide them to new understandings of brain function. But could there be another explanation for this remodeling of the theoretical contingencies? That the brain of a theorist living and breathing is sculpted in a specific moment of history defined by the changing political, economic, psychological, spiritual and sociologic relations? That like the material history of objects and relations the brain, too, undergoes material changes relative to this mutating zeitgeist?

The primary repertoire describes the condition of the initial variability of the anatomy of the brain at birth that is produced by a process called developmental selection. First, it relates to the variation that results from the combination of the DNA contributed by the father's sperm and the mother's egg as two very diverse genetic heritages. Secondly, it relates to the history of the species itself in its evolutionary journey, and to the conditions of the genes that reflect that history. Finally, it is the result of events that take place during the pregnancy. For example, the effects of smoking, drinking or cocaine use on the condition of the developing foetus's brain are well-known. The combined effect of these three processes is the production of the neurobiologic common from which the brain-mind will later emerge in its engagement with culture. The neurobiological common is the entire, genetically inscribed repertoire of possible excitatory, inhibitory, resonant and dissonant neural relations as they are tethered to their intrauterine experience. Together, they create the neurobiologically variable pluripotentiality of the brain. Even the brains of identical twins at birth differ remarkably. Although the primary repertoire is to a certain degree pre-specified by genetic programs, which produce the heterochronic events of its neural development, it also contains within itself tremendous amounts of variation and diversity. This variation is a result of the evolutionary experiments (leading to the human nervous system) that are still subsumed in the human genome and that under certain environmental stresses can become expressed.[32]

[32] "Even so, the human race is distinguished from other species by its remarkable ability to learn and conserve stable traces of past experience. In the course of evolution, this aptitude has grown to an extent unrivaled in the living world. Moreover, vestiges of man's evolutionary past are still perceptible in the early stages of the brain's development." Changeux, *Physiology*, 184.

It is the degree of this variation in its primordial and plastic state that makes the primary repertoire relatively unspecified and to which "unspecified" and "stochastic" conditions of a changing cultural milieu can hail.

I would like to call attention to the primary repertoire as the site of what is referred to as neural biodiversity, and of what I would like to refer to as the neurobiologic common or neurozoon. The neurozoon embodies the full extent of the possibilities of a human brain and contains within itself all the evolutionary steps that make up its ontogenesis, some of which are now suppressed and not expressed at the level of the chromosome. It awaits the moment of its unfolding not as a natavist series of heterochronous events emblazoned in the codon of the genome *a priori*, but rather as an unfolding or becoming in the context of designed culture. This neurozoon emerges as a subset of the *zoe*, which is then sampled to become the *neurobios*. The *neurobios* is the secondary repertoire with all the political implications contained therein.

"Biodiversity is a composite term used to embrace the variety of types, forms, spatial arrangements, processes, and interactions of biological systems at all scales and levels of organization from genes to species to ecosystems, along with the evolutionary history that led to their existence."[33] Neural biodiversity by analogy is first of all a species-specific condition that delineates the specific a priori variability of neural elements, including their physical and chemical idiosyncrasies, and the neurobiological apparatus that allow for the neuroplastic potentiality to express itself. It is a condition of the evolutionary history of that species and contains its complete history of neurobiological adaptations that were required in its ascendance as/to that species.

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[33] Robert J. Scholes *et al.*, "Toward a Global Biodiversity Observing System," in *Science*, 321 (2008), 1044.

Evolution is not the precise knife-carving of an organism into a finely adapted machine. It sculpts grotesque figures more like Jonathan Meese's *Metabolism. No Zen in the Bronxen, You Atomic Human Toy* (2008) or paints feverently, as in William De Kooning's *Woman* (1949). Both works depict bodies that are not formed perfectly, but contain many imperfections. Yet, they are still discernable as figures and, as a result, they elicit multiple readings. They are parabolic forms. Evolution sculpts variations, but it maintains a pool of variation for its "other" self-fulfilling prophecies.

I would like to contend that neuropower is in fact directed towards this neural biodiversity, attempting to limit its potential. In other words, just as global biodiversity is currently under siege by various factors affecting the conditions of global capitalism (including, pollution, over-fishing, and the encroachment of habitat, effecting as it does the diversity of flora and fauna), so too do other conditions of this same world-system strangle difference to produce a homogenization of the cultural field and limit epigenetic, neural biodiversity. Neoliberal global capitalism, of which neoliberal cognitive capitalism is a subset and recent developmental stage, provides the precise mechanisms for this process of specified differentiation. For instance, it is feared that in a century, one half of the 6,700 languages now active on earth will disappear. The effect of this language depletion in the context of language ecologies and indigenous peoples has been recently written about by K. David Harrison in his book *The Last Speakers: The Quest to Save the Worlds Most Endangered Languages*.[34]

[34] David Harrison, *The Last Speakers: The Quest to Save the World's Most Endangered Languages* (Washington, D.C.: National Geographic Press, 2010).

The next term elucidated by Edelman is the idea of the secondary repertoire, which is the direct result of epigenesis and neural plasticity during a process called experiential selection. The term repertoire often relates to musical performance and designates the full scope of a performer's abilities. In fact, Gerald Edelman, one of the founders of neural Darwinism, is himself a musician. The obvious connection to new labor as a virtuoso performance and its association with a number of possible activities that link labor and politics, and that have repercussions for the material of memory, interests us here.[35] As we already suggested, neuropower posits that the virtuoso performance does in fact leave a materialist residue. Rather than the industrially formed products characteristic of secondary economies, performances leave lingering memory traces that have the potential to mutate the conditions of the neurobiologic architecture. In tertiary economies, the results of its production are the new memory sculptures and architectures of the brain. Coupled to the new cultural dispositions that emerge through immaterial labor, these neural compensations and de-compositions—remember the neural changes can be additive and subtractive—generate the conditions for thinking itself.

A neural constructivist account could also make this argument. However, instead of resulting from a regression and deletion of neural elements, the secondary repertoire in this explanation is the result of a productive complexification and intensification. As we noted earlier, epigenesis refers to the process by which the environment affects the patterns of stimulation and communication in the neurons and neural networks of the primary repertoire.

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[35] Paolo Virno, *A Grammar of the Multitude: For An Analysis of Contemporary Forms of Life* (New York: Semiotext(e), 2004), 70.

Hebbian theory, which states that neurons that fire together wire together, is operative in the primary repertoire where spontaneous electrical activity stimulates genetically prescribed a priori networks. "When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased."[36] In the secondary repertoire, Hebbs' cell assembly hypothesis is even more relevant as such electrical activity is joined by that which is generated by objects and object relations in the world, both real and abstract, and, in the case of our world, the conditions of information and its distribution as dynamic codes in the real-imaginary-virtual interface.

> The probability that neurons synchronize their responses both within a particular area and across areas should reflect some of the Gestalt criteria used for perceptual grouping… Individual cells must be able to change rapidly the partners with which they synchronize their responses if stimulus configurations change and require new associations… If more then one object is present in a scene, several distinct assemblies should form.

[36] Georgy Buzsáki, *Rhythms of the Brain* (Oxford: Oxford University Press, 2011), 159. Hebb's cell assembly is a transient coalition of neurons, much like the dynamic interactions among jazz musicians. Members of the cell assembly are brought together by Hebb's synaptic plasticity rule, on the basis of temporal relations among them. As a result of this plasticity rule, information reverberates within the formed assembly and the direction of flow is determined by the synaptic strengths among the members.

> Cells belonging to the same assembly should exhibit synchronous response episodes whereas no consistent temporal relations should exist between the discharges of neurons belonging to different assemblies.[37]

In an intensive information culture defined by hubs, energy sinks in a distributed field. It is these dynamic codes that have become most important. An implication of Hebbian dynamics and neural Darwinism is that those assemblages of neurons most intensely and repetitively stimulated, develop firing potentials that are selectively reinforcing to each other, whereas those not as stimulated undergo a process termed apoptosis and die out or manage to form connections with neurons in the network that is favored. Consequently, in the battle for limited neural space, the stimulated neurons and their networked condition replace those that have receded. It is not a difficult intuitive leap to understand how branding and other tools of the global economy could create new Gestalt relationships necessary to stimulate cell assemblies. We can all imagine how the hot touch of the branding iron on the backside of cow's hide is replaced by the buzz of the information age soldering networks together. "Semiocapital, in fact, is not about the production of material goods, but about the production of psychic stimulation. The mental environment is saturated by signs that create a sort of contiuous excitation, a permanent electrocution, which leads to the individual, as well as the collective mind, to a state of collapse."[38]

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[37] Wolf Singer, "Coherence as an Organizing Principle of Cortical Functions," in *Selectionism and the Brain*, eds. Olaf Sporns and Giulio Tononi (San Diego: Academic Press, 1994), 158.

[38] Berardi, *After the Future*, 94.

The development of ocular dominance columns of layer IV of the primary visual cortex is a case in point. Ocular dominance columns, anatomical structures that appear like columns in microscopic examination, are found in the visual cortex and are anatomically defined regions of input from one eye or both eyes.[39] They contain a number of genetically defined cell types simple, complex, and hypercomplex cells that are arranged in a columnar structure. They are stimulated by the visual fields preferentially and utilize different strategies for the processing of visual information like, the orientation of a light.[40] As a unit, they are important in processing visual information and they are driven by one eye or the other. In experiments by Hubel and Weisel, enucleation of one or the other eye created disruptions in the normal columnar structure with those neural elements coding for the non-enucleated eye displacing those cells formerly driven by the now enucleated eye. As Antoni and Stryker note, "two hypotheses regarding their development have been suggested. One, conforming to selectionism, emphasizes two phases in the right eye development: a period of exuberant growth followed by selective axonal pruning. The other, more constructivist, hypothesis emphasizes the general expansion of axon collaterals alongside selective pruning."[41] This theory promotes neural development as a system that is said to be regressive and subtractive.

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[39] Semir M. Zeki, "Cells Responding to Changing Image Size and Disparity in the Cortex of the Rhesus Monkey," *Journal of Physiology* 242 (1974), 827.

[40] Charles Robert Noback et al., *The Human Nervous System: Structure and Function* (Totowa, New Jersey: Humana Press Inc., 2005), 340.

[41] Quartz, S.R., *The Neural Basis*, 17.

Neural constructivism interprets this Hebbian mechanism as favorably exciting those neurons most apt to be stimulated, thus promoting their further development and producing increased synaptic numbers and dendritic spines. Where "representational features of the cortex are built from the dynamic interaction between neural growth mechanisms and environmentally derived neural activity ... this growth is a progressive increase in the representational properties of the cortex."[42] These mechanisms are important in understanding the brain's development, but most essential for our purposes here is the transformation of an immature neurobiological substrate into a finely tuned environmentally and contextually driven machine.

What then is the effect of living in a networked society with the internet, cell phones, Facebook, and Twitter? We are all spending more and more time in linked environments and these linked social anatomies are finding expression in the modifications of designed built space. The *Alishan Tourist Routes* of Reiser and Umemoto, Toyo Ito's *Taichung Metropolitan Opera House* and *The Island City Central Park Gringrin*, and Zaha Hadid's *Hungerburg Funicular* are cases in point. How do these new spatial and temporal contingencies effect experiential selection? And what of the perceptual and cognitive habits that they elaborate? Although we have defined the primary repertoire and the secondary repertoire separately, they are part of the same overlapping and interdependent process. The genetic instructions continue to unfold throughout life, in particular in the context of learning, the critical period for language learning, for example, and this learning changes the conditions of the brain itself. Learning a language changes the conditions of interacting with the world and thereby changes the brain's selection of material relevant to "its" attention.

[42] *Ibid*, abstract.

What we pay attention to greatly "informs" what we learn and what neural networks will be activated and amplified.

Unlike natural selection in evolution, which occurs as a result of differential reproduction, experiential selection comes about through differential amplification of certain neuronal populations. Those neurons, neural networks, and distributed neural mappings that are most frequently and intensely stimulated by, for instance, advertised toys that appear and reappear in real and televised environments, or by movie stars whose images adorn multiple platforms synchronously on billboards, laptops, movie screens, and televisions, will develop more efficient firing patterns or become progressively more phase-locked—synchronously tethered together—giving them selective advantage over those that are not.

A third tenet of the theory of neuronal group selection is called reentry. Reentry is defined as the recurrent parallel exchange of neural signals between neuronal groups or maps taking place at many different levels of brain organization: locally within populations of neurons, within a single brain area, and across brain areas. The importance of reentry as a mechanism of neural integration has been realized.[43] The anatomically distinct areas of the brain, the primary sensory areas like the visual cortex as well as the more modern associative cortices consist of distinct areas that code for different information. For instance, the research of Semir Zeki and others has shown that the visual cortex is made up of functionally segregated areas that code for specific attributes like the form and color of a visual object.

[43] Giulio Tononi, "Reentry and Cortical Integration," *International Review of Neurobiology Volume 37*, 1994, 127–152.

They are linked by what are referred to as cortico-cortical and thalamo-cortical connections, because they connect regions of the visual cortex together and the thalamus, a subcortical structure, to the cortex.

In some ways, each of these areas samples and produces maps of the world based on their specific biased apparatus. For instance, area V4 of the occipital cortex samples the world according to color. That is: its cells are wavelength selective, while those of V5 are moti.on selective.[44] But we don't see the world as disjointed patterns of color and motion but rather as a seamless whole. Why is this? It is through reentry that these disparate regions are linked together in register-producing an integrated picture/image. It is through this process, which is referred to as binding, that these different registers are bound together. We also know through experience that several such sensory areas can work together. When eating an apple you are using taste, smell, and vision as well as coordinating various tactile and motor repertoires, as the apple is adjusted to bring it in register with the mouth and tongue. Reentry is one way that these maps are integrated together. Superimposed on these primary areas are meta-representations coded for in association areas and linked to corresponding areas of other parts of the brain such as the frontal lobe, hippocampus, cingulated gyrus, and so on. Eating an apple is a planned event that rehearses other already registered memories of former interactions with the apple and the satiation of hunger, and so on and so forth. Reentry also plays a role in binding these regions as global mappings, as it refers to the whole brain activated at the same time.

[44] Semir Zeki, ed., *A Vision of the Brain*, (Oxford: Blackwell Scientific Publications, 1993), 126.

"This suggests a close relationship between consciousness and binding. It seems that only those results of the numerous computational processes that have been bound successfully will enter consciousness simultaneously. This notion also establishes a close link between consciousness, short-term memory and attention."[45]

An understanding of binding may be a key to phenomenologic immersion—the feeling that when you are reading a book, watching a movie, or are actively engaged in a virtual reality program, you are actually taking part in the action of the movie, book, or virtual reality program. Binding is not a process only occurring in the brain but in the world of objects, their relationships, and, today in the abstract real relations that now capture our attention in the informational economy. Binding in the brain is not a constantly elaborated phenomenon, but one that is immanent.

> In the binding by synchrony model, convergence of connectivity is no longer the main variable of feature extraction: rather, it is the temporal synchrony of neurons, representing the various attributes of objects, that matters. The different stimulus features, embedded in the activity of distributed cell assemblies, can be brought together transiently by the temporal coherence of the activated neurons, which oscillated at gamma frequency.[46]

As we have seen, in tertiary economies the once physical object of production has dematerialized and instead has been substituted for non-material abstract conditions.

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[45] Thomas Metzinger, *The Ego Tunnel: The Science of the Mind and the Myth of the Self* (New York: Basic Books, 2009), 67.

[46] Buzsáki, *Rhythms of the Brain*, 260-61.

Binding in tertiary economies no longer "only" binds various aspects and points of view of the object, but rather the myriad of stories and relations that create its meaning today. Through the elaboration of a set of epistemologic trajectories, neoliberal cognitive capitalism creates fields of bound signifiers in the form of brand alliances that call out to the brain-mind of its subjects, producing synchronous discharges in the neurobiological architectures that are its correlates.[47]

In neoliberal cognitive capitalism, synchronous machinic assemblages of culturally bound abstract architectures tuned together as dispositions resonate with prescribed spontaneous autonomous neural excitations to form analoguously inscripted neural plastic facsimiles. A social group or culture can share these dispositions. This process may result in the formation of a people who share similar perceptual and cognitive ideas about the world.

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[47] *Ibid.*, 238-239. The concept of synchronicity was born through the analysis of the dreams of physicist Wolfgang Pauli by Carl Jung. After analysis of over 400 dreams, Jung defined synchronicity as "the coincidence, in time of two or more causally unrelated events which have the same or similar meaning…" Synchronicity describes some striking and apparently inexplicable "meaningful coincidences" or "significantly related patterns of chance" when, for example, the contents of a dream are paralleled in a pattern seemingly unconnected to external events. In their use of the term, synchronicity corresponds to "'a causal connecting principle' as opposed to causality." The neurophysiologic definition is somewhat more complex. First, it relates to a discrete temporal window determined by a neuron or a group of neurons. "This period can be defined by the time within which some trace of an earlier event by one input is retained, which then alters the response to a subsequent event to other inputs. … The relevant temporal window for integration is the time within which a unitary postsynaptic potential, brought about by one input, decays back to baseline. Events that occur beyond this window are deemed non-synchronous, because the earlier event does not have any impact on the later response."

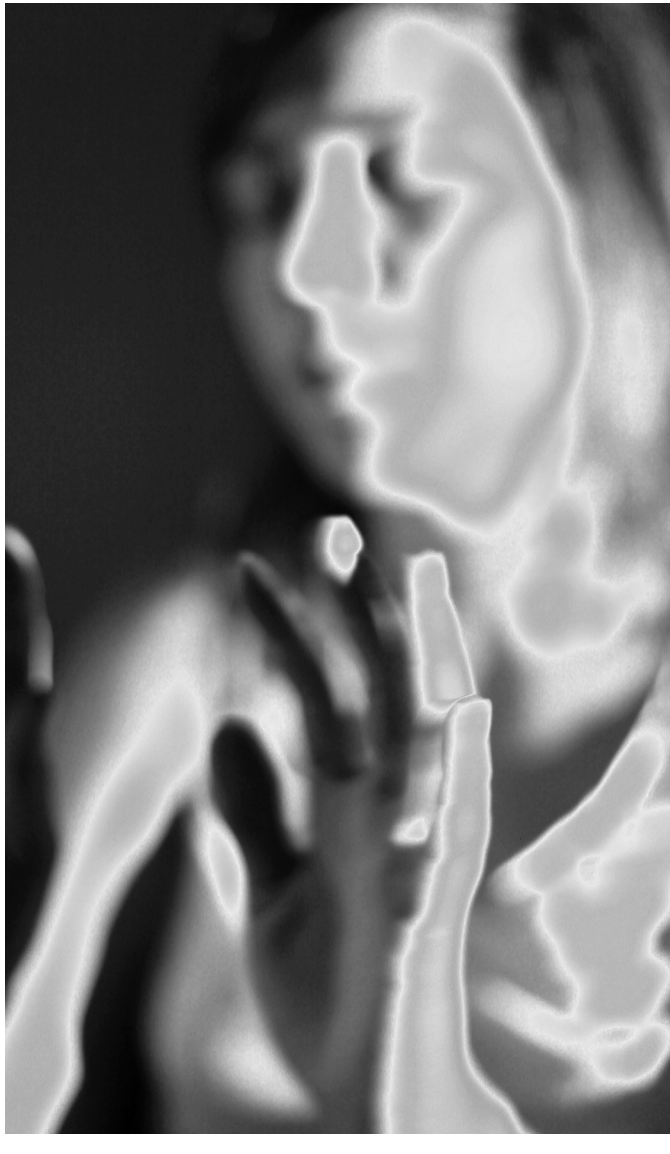
Thus, intra-cerebral binding that occurs underneath the skull, within the boundaries of local maps, and those occurring throughout the brain as global maps can be "extended" beyond the brain/skull to engage as inter-cerebral binding in the social context. Thomas Metzinger, alluding to the work of Antonio Damasio, notes:

> We mentally represent ourselves as representational systems, in phenomenological real-time. This ability turned us into thinkers of thoughts and readers of minds, and it allowed biological evolution to explode into cultural evolution. The Ego is an extremely useful instrument-one that has helped us understand one another through empathy and mind reading. Finally, by allowing us to externalize our minds through cooperation and culture, the Ego, has enabled us to form complex societies.[48]

The epistemological apparatuses embedded in culture facilitate these conditions of mind-reading and other-mind knowledge. It is to these apparatuses that the contemporary sovereign directs its attention in the production of a unified people.

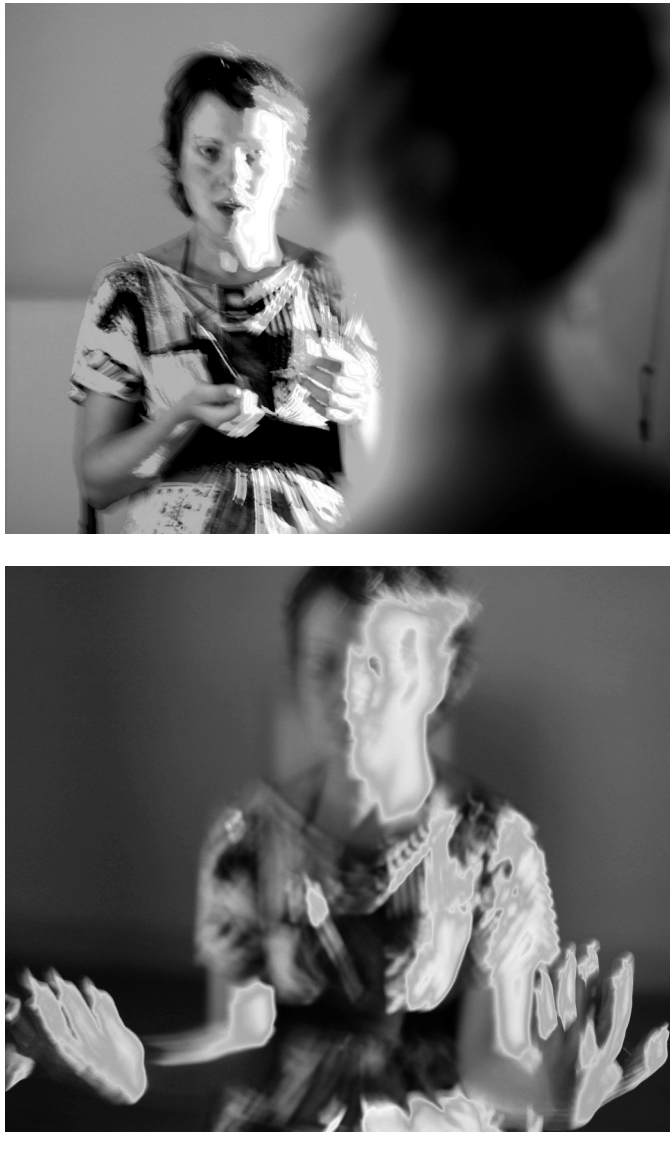
[48] Metzinger, *The Ego Tunnel*, 67.

Warren Neidich, *The Noologist's Handbook*, Ljubljana, 2011, C-print



Warren Neidich, *The Noologist's Handbook*, Ljubljana, 2011, C-print

Warren Neidich, *The Noologist's Handbook*, Ljubljana, 2011, C-print



Warren Neidich, *The Noologist's Handbook*, Ljubljana, 2011, C-print

Art Power: Resistance is Fertile

> Deleuze describes the brain as a relatively undifferentiated mass in which circuits aren't there to begin with: for this reason, creating new circuits in art means creating them in the brain too. The cinema does more than create circuits, though, because, like a brain, it consists in a complexity of images, imbricated and folded into so many lobes, connected by so many circuits. While cinema can simply reiterate the facile circuits of the brain, appealing to arbitrary violence and feeble eroticism, it can also jump those old grooves, emancipating us from the typical image-rhythms… opening us to a thought that stands outside subjectivity.[49]

"Cultural Creatives"—in all their many forms as visual artists, poets, dancers, musicians, cinematographers, and so on—are able to play a role in the production of resistant cultural regimes. Such practices have important implications for thinking the mechanism through which the fruits of artistic labor might compete for the brain-mind's attention, thereby leading to reactions and effects in the molding of the neural plastic potential. The power of art, in its most utopian sense, is to create or recognize externalities existing at the margins of cultural milieus, in order to release a cultural potential. Artists using their own materials, practices, histories, critiques, spaces, and apparatuses can create alternative distributions of sensibility—or redistributions of sensibility—that call out to different populations of neurons and neural maps, potentially producing different neurobiological architectures. Some examples are necessary to make this tangible.

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[49] Gregory Flaxman, *The Brain is the Screen: Deleuze and the Philosophy of Cinema* (Minneapolis: University of Minnesota Press, 2000), 31.

Think here for a moment about the relationship between Mozart's S*onata for two Pianos in D Major*—associated with producing the "Mozart effect" and that of noise, free music or improvisation. In 1993, Gordon Shaw and a graduate student, Frances Rausher, showed that listening to the first ten minutes of this composition produced an increased ability for spatial-temporal reasoning.[50] He later states as a conclusion that the "symmetry operations that we are born with and that are enhanced through experience form the basis of higher brain function." Finally, "[p]erhaps the cortex's response to music is the Rosetta Stone for the code or internal language of higher brain function."[51] Even so, Shaw and company are forgetting an important consideration: we still don't know how first audiences responded to this music. Maybe instead of music it initially sounded like noise. Perhaps the first audiences who listened to this work by Mozart responded in a similar way as audience responding to Beethoven's *Fifth Symphony* for the first time.

> As chronicled in Nikolas Slonimsky's perversely wonderful Lexicon of Musical Invective, even the most comfortable and cherished staples of our current repertoire, including Brahms, Chopin, Debussy and Tchaikovsky, had been condemned by contemporary esthetes in the very same way. Even Beethoven's *Fifth Symphony*, now the most popular classical work of all, was damned as "odious meowing"—and not music—decades after its premiere.[52]

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[50] Gordon L. Shaw, *Keeping Mozart in Mind* (San Diego: Elsevier Academic Press, 2000), xxii.

[51] *Ibid*., 108.

[52] Guttmann, Peter, "The Sounds of Silence," copyright 1999, http://www.classicalnotes.net/columns/silence.html.

Like those modernist observers discussed by Fredric Jameson, who experience the postmodern space of the Bonaventure Hotel[53] or the scandalous reception of Marcel Duchamp's *Fountain* (1917) in the exhibition Society of Independent Artists of the same year, earlier audiences listening to Beethoven's *Fifth Symphony* for the first time had not developed the perceptual habits to understand and integrate its rhythms and melodies. These artworks were sublime, because they and beyond the cognitive capabilities of their neurobiologic apparatuses to make sense of them.

But what does this have to say about noise or free music or improvisation? Rather than enlisting circuits already on hand or parasitizing already existing cerebral rhythms, noise and its bedfellows, both improvisation and free music, operate, in fact, through their attempt to delink themselves from these already present patterns, creating instead resistances and emancipatory gestures. Anthony Isles, quoting Edwin Prevost, focuses on the crucial condition of improvisation and free music with particular attention to leading jazz musicians such as Ornette Coleman. Examining how they come into being and how they are made, he notes that instead of practising a written score and matching it, "musicians train, developing their musical capacities through a process of 'de-skilling' and 're-skilling.' What these musicians are developing ... [is] the ability and attention necessary to be able to respond to their co-players, to a situation and to an evolving musical time/space."[54] Each instrument plays its own score adapted to its own proclivities and idiosyncrasies.

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[53] Fredric Jameson, *Postmodernism, or, The Cultural Logics of Late Capitalism* (Duke University Press Books, 1990), 38.

[54] Anthony Isles, "Introduction: Noise and Capitalism," in *Kritika* 02 (2009), 19.

This idea of learning to pay attention to a set of gestures occurring in time, an anatomy of signs in a confined social space in which nothing is certain, produces ruptures and asynchronies.

How different, however is the following quote to the views voiced by Gordon L. Shaw which we encountered above: "And this musical space relates to another musical time, freed from the score and freed from repetition, by neither having a set time nor tempo allotted, improvised music breaks with linear cumulative time and narrative historicization."[55] One might then ask how noise and improvisation become sensible? Referring to Csaba Toth in the same collection of texts, Isles refers to noise "as the other side of music and everything outside the discipline, literally encompass(ing) what hasn't been discovered as music yet."[56]

What was it like for an audience to first hear a John Cage performance *4'33"* (1952)? *4'33"* (pronounced "Four minutes, thirty-three seconds," or, as the composer himself referred to it, "Four, thirty-three") is a three-movement composition by American avant-garde composer John Cage (1912–1992). It was composed in 1952 for any instrument (or combination of instruments), and the score instructs the performer not to play the instrument during the entire duration of the piece, that is, throughout the three movements. For those not familiar with this work, a description of its first performance by pianist David Tudor will lay the framework. First setting himself at the piano he then opened the keyboard lid and sat silently for thirty seconds. He then closed the lid once and then quickly reopened it. There he sat motionless for a full two minutes and twenty-three seconds. He then closed and opened the lid one more time, sitting silently for one minute and forty seconds.

[55] *Ibid*.

[56] *Ibid*.

Finally he closed the lid one final time and walked off the stage. One can find another version of the work on YouTube in which the piano is originally open and where Tudor rests a pocket watch on the lid of the piano to accurately monitor the time.

Although commonly perceived as "four minutes thirty-three seconds of silence," the piece actually consists of the ambient sounds of the environment that each listener hears while it is being performed and the continued sense of unease directly following. The piece pushes each of the listeners outside his or her presumed concert space to sample their own combination of ambient sounds. Noises such as a pencil dropping, the breathing and coughing of others, one's own heartbeat as a result of one's own intimidation, a baby's cry all become the score of an internalized and individually created composition. More importantly, this work follows Cage's more general investigation into time. By stripping the music of its musical score and laying bare its temporal underbelly, he conflates time. Time is stretched and without its musical bearing the audience's appreciation of time is disrupted.

As early as 1937 in his now famous essay "The Future of Music: Credo," Cage laid out some important considerations of the reception of noise. "Wherever we are, what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating."[57] Listening to a hardcore noise band in a venue like, for example, Staalplaat in Berlin's Neukölln district or at Jabberjaw in Los Angeles is for some a revelation and for others a cacophony. For others still who are willing to linger there, a learning curve is embarked on as one's initial fascination with a dissonant barrage of totally nonsensical sounds becomes understandable and indeed pleasurable.

[57] John Cage, "The Future of Music: Credo," *Silence* (Wesleyan University Press, 1961) 3.

According to Gyorgy Buzsáki, "what makes music fundamentally different from (white noise) for the observer is that music has temporal patterns that are tuned to the brain's ability to detect them because it is another brain that generates these patterns."[58] But noise as well as free music and improvisation are not sensible for everyone, even though another human brain has made it. For some, what is noise will always remain so. But for others a form of adaptation does seem to occur. Are there differences between people as to their underlying cerebral circuitry and the degree to which that circuitry is modifiable? We all know older people who are very open to new things and trends, and who like nothing better than to hang out with teenagers better than their own age group. Are these individuals part of a sub-population who have a more supple and adaptive nervous system, one which thrives on the multiplicity of connections? Moreover, do these changing musical tastes imply more flexible dynamic organizations that, for instance, are linked to unabated neural plasticity that might accommodate dynamic reorganizations into later life?

The appreciation, in its day, of noise and improvisation is at first localized for a limited and select population. Nonetheless, today this population has grown, with noise gaining wider recognition in mass music culture. Individuals pay money to see bands perform, visit the venues where such performances can be found, and buy and exchange CDs or MP3 audio by their favorite artists—even though noise music remains conspicuously absent on both popular mainstream radio stations and MTV. Certain artists like John Wiese, in his recent album *Circle*

[58] Buzsáki, *Rhythms of the Brain*, 201.

Snare, are breaking this pattern and are adapting noise and mixing it with punk to engage mainstream audiences.[59] Perhaps noise, more than simply being a form of resistant experience, coheres around a population of brains whose perceptual habits have been formed according to a different logic, one based on an immanent field of dissonant patterns that linger in the pluripotential cultural field as disjointed externalities orbiting small foci of meaning and that have yet to join the contemporary cultural *Zeitgeist*. Just as the brain uses miniscule portions of its temporal coding potential, culture's similarly underutilized potentiality is also the reason of its continual experimentation at the margins of temporal experience.

Perhaps those who are the vanguard and thus the first to appreciate noise music are a group of individuals who favor dissonant and distressed aesthetics, like those marching to a different drummer, who prefer to cross a grassy knoll diagonally rather than follow the man-made stone pathway. Or maybe our culture has itself tuned its pattern recognition capabilities towards the images and sounds of interactive medias, photographic-video hybrid apparatuses that create typologies of topologies of disconnected patterns produced by images of incomplete bodies appropriated by the fashion industry to capture a younger generation's attention as they are assembled on billboards framing public spaces. Such patterns that are implicitly activated in, for example, the slow motion, uncoordinated falling of a recently checked hockey player-replayed over and over again on cable TV screens or monitors at sport bars—and, to offer a further example, in the particulate diffusion of spectacular light seen

[59] Discussion with Andrew Berardini at *Café de Leche*, Highland Park, Los Angeles.

in the explosion of a building videotaped and which is then edited in Adobe After Affects CS6 as action, stop action, further repackaged as a QuickTime movie downloadedable on YouTube, a video-clip which can even be played in reverse! On the other hand, home video editing programs on laptops like Final Cut Pro and iMovie allow everyone and anyone to be a filmmaker. Everyone is an artist, since contemporary technologies have made once difficult skills easier to learn and widely available.

Think for a moment of how the profession of photography has become democratized. I remember how difficult it once was with analogue cameras and films to document one's installations especially in mixed light situations. Today, with the proper camera settings and software computer programs, great results are easily managed. Most radical filmmaking techniques and gestures, like the montaged effects found in such movies as Dziga Vertov's *Kino-Eye* (1924), are commonplace motifs of MTV-type music videos made by amateurs and found on YouTube; they also appear into more corporate structures like the special effects and fast feed forward editing found on ESPN or the foregrounding of trucage and special effects in movies like *Time Code* (2000), in which the screen is divided in four so as to depict different stories unfolding simultaneously; or even in *Inception* (2010), in which special effects create the look and feel of video games. Special effects have overwhelmed other aspects of film and TV such as plot and character, driving viewers into movie theaters as the tremendous success of *Avatar* (2009) and *Inception* (2010) would suggest.

These methodologies are directed towards a new generation of viewers who have incorporated the resulting new temporalities of the fast cut and reverse motion of the moving image into their cognitive regimes. In today's image-based culture, knowledge of these grammars of image-regimes is essential for determining what's new and in and cool.

In advertisements for products this is the new language of collage, where fast cut is indexical for youth culture. As such, it participates in the avant-garde of mass consumerism.

What is most important here is the way that these images capture the attention of a specific generation of subjects whose brains have been sculpted by these novel cultural landscapes. Brains cultivated in semiocapitalistic environments are primed for what Paul Virilio has called phatic signifiers. In our present day world, these phatic signifiers have been bound together as branded networks of phatic signfiers which couple to similary bound global neural networks, those networks that are connected throughout the cerebral cortex to link to the brainstem pleasure centers, in the brain. In fact, these shared neurobiologic conditions produce the reification to produce our tastes, and these techniques of mass consumerism invent the new criteria by which to judge a new product. This knowledge is essential as it is neural selective or constructive and might even lead to a form of sexual selection. If you are hip to the new fashions, and perfumes, which are signified by these video styles, you may be more popular which in turn might lead to gaining increase status as well as an advantage in mate selection. If cool girls or guys with this same knowledge and taste is what you are after! Such cognitive regimes thus constitute what Pierre Bourdieu refers to as habitus: a unique synthesis of one's genetic endowment, circumstances of birth and upbringing, and subjective experience of the social and cultural environment in which one has grown up.

Are these then the new dynamic cultural signifiers determined by Hollywood and Madison Avenue as the attention attractors for a new generation? Perhaps it is an anaesthetics of decay and destabilization that is now drifting through a population of psychic vampires hungry for new forms of sensuality and entertainment but which in the end create new systems of neural networks that in their totally combinedal condition feedback on self-reflection itself and producing the new conditions for thought.

Conclusion

> During long periods of history, the mode of human sense perception changes with humanity's entire mode of existence. The manner in which human sense perception is organized, the medium in which it is accomplished, is determined not only by nature but by historical circumstances as well. The fifth century with its great shifts of population, saw the birth of the late Roman art industry and the Vienna Genesis, and there developed not only an art different from that antiquity but also a new kind of perception… They did not attempt—and perhaps, saw no way—to show the social transformations expressed by these changes of perception. The conditions for an analogous insight are more favorable in the present. And if changes in the medium of contemporary perception can be comprehended as decay of the aura, it is possible to show its social causes.[60]

The above quote goes to the very heart of the discussion explored here, which has ramifications for the production of subjectivity and its horrors. How does human sense perception change with humanity's entire mode of existence? Is human sense perception and cognition linked to the changes occurring in social, political, psychological, spiritual, and economic relations which inflect themselves through aesthetic objects, non-objects, performances, spaces, non-spaces that together form the semio-linguistic and cultural landscape?

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[60] Benjamin, *Illuminations*, 222.

A landscape that embodies, we should note, those very material historical conditions that were responsible for its becoming, and that are then coupled to various material and immaterial neurobiological relations and their mental productions, like synaptic stabilizations and prunings as well as dynamic mappings, which effect the operations of our perceptual-cognitive apparatuses.

If the fifth century with its great shifts of population produced the birth of the late Roman art industry and the Vienna Genesis, promoting not only an art different from that antiquity but also a new kind of perception, then what of our own epoch as it leaps through the hoops of modernist extensive linear productivity of the assembly line into a post post-modern condition of intensive networks and non-linear anywhere any place on-time productivity of on-line prosuming and crowdsourcing? Antonio Negri sums this up in the following statement:

> We can no longer interpret these according to the classic labor theory of value that measures work according to the time employed in production. Cognitive work is not measurable in those terms: it is even characterized by its immensurability, its excess. A productive relation links cognitive work to the time of life. It is nourished by life as much as it modifies it in return and its products are those of freedom and imagination [...]. Of course, work still remains at the center of the entire process of production [...] but its definition cannot be reduced to a purely material or labor dimension. This constitutes the first element of the caesura between modern and the Postmodern.[61]

[61] Antonio Negri, *The Porcelain Workshop: For a New Grammar of Politics,* trans. Noura Wedell (Los Angeles, CA: Semiotext(e), 2008)

What kind of new perceptual capabilities might this caesura engender? Is it a mimetic condition that is analogically superimposable or a collage in which bits and pieces form a larger whole? Is the transition then a soft shift from one world picture or cinema to another? And the subjectivities that are as a result formed—do they follow suit? Is the changeover from one subjectivity to another smooth and consistent or are there fits and starts and spasm, schisms and general incommensurabilities—and is it in this gap of non-register that we discover the space for the evolution of physical and psychologic pathologies? For instance, did the conditions of the nineteenth century produce the great spasms of ideas that led to the invention of photography and cinema? Can they be linked to similar and analogous disruptions in the history of art found in Impressionism, Post-impressionsim and Constructivism? Were they both mirrors of changes in the brain of subjectivities that required new technologies and forms of representation to present the evolving conditions of brain, mind and world? One could also ask: how did changing conditions of laboring and the machinic intelligence which revolutionized the very conditions of attention feedback upon the web of possibilities to make the representation of the world and consciousness different?

Certainly Benjamin intuited this when he wrote, "To pry an object from its shell, to destroy its aura, is the mark of a perception whose 'sense' of the universal equality of 'things' has increased to such a degree that it extracts it even from a unique object by means of reproduction."[62]

[62] Benjamin, *Illuminations*, 222.

That a form of fantastic and phantasmic thinking, whose habits have been formed in environments of mass reproduced images, has now taken over to to an unprecedented extent is evident from the fact that even real objects seem reproduced or are seen as aura-less. Therefore, one could also ask if analogous conditions to those of mass reproduction were taking place in other spheres of knowledge and great functional systems. One might then ask if the specifically nineteenth century psychopathologies like neuroaesthenia and hysteria were pathologic manifestations of similar tsunamis of mass reproduction as they occurred in the social, political, historical, spiritual, and sociologic fields. Importantly, new regimes of philosophy and mental treatments like psychoanalysis, conceived in this context, needed be invented to treat them. Government too heeded the call of these new conditions by utilizing, for instance, mass media as normalizing and homogenizing machines. Are the atrocities of the Second World War examples of mass reactions to this contemporary decay of the aura on a mass scale? Importantly, what might this say about our own time in our moment of extreme technological, social, cultural, and psychological shifting brought on by the revolution in informatics?

I wager that new theoretical approaches, like for example the idea of neuropower—linked as it is to semiocapitalism and cognitive capitalism—may provide the epistemic apparatuses to engage with these questions to think them anew. Benjamin's intuitions are just as true today as they were then: "The conditions for an analogous insight are more favorable in the present."[63]

[63] *Ibid*., 223.

This book collects the papers that were presented at "The Psychopathologies of Cognitive Capitalism: Part One" conference in Los Angeles in November 2012. The conference brought together an international array of philosophers, critical theorists, media theorists, art historians, architects, and artists to discuss the state of the mind and the brain under the conditions of cognitive capitalism, in which they have become the new focus of laboring. How have emancipatory politics, art and architecture, and education been redefined by semiocapitalism? What might be the lasting, material ramifications of semiocapitalism on the mind and the brain?

The Psychopathologies of Cognitive Capitalism: Part One is part of a series that will pursue these and other questions. What is the future of the mind under cognitive capitalism? Can a term such as plastic materialism describe the substantive changes in neural architectures instigated by a contingent cultural habitus? What about the unconscious under these conditions? How might it be modified, mutated, and modulated by the evolving conditions of global attention? Is there such a thing as cognitive communism, and what might be its distinctive pathologies? How does artistic research—the methods and practices of artistic production and the knowledge they produce—create new emancipatory possibilities in opposition to the overwhelming instrumentalization of the general intellect under semiocapitalism?

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