



**Cognitive  
Architecture.  
From Biopolitics  
to Noopolitics.  
Architecture &  
Mind in the Age  
of Communication  
and Information**

**Editors Deborah Hauptmann and Warren Neidich**

**010 Publishers**

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# Cognitive Architecture. From Biopolitics to Noopolitics. Architecture & Mind in the Age of Communication and Information

**Editors Deborah Hauptmann and Warren Neidich**

With contributions by **Andreas Angelidakis, Lisa Blackman, Ina Blom,**

**Felicity Callard, Suparna Choudhury, Jordan Crandall, Elie During,**

**Keller Easterling, Lukas Ebensperger, Boris Groys, Janet Harbord,**

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**Markus Miessen, Yann Moulier Boutang, Warren Neidich, John Protevi,**

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**Gabriel Rockhill, J.A. Scott Kelso, Terrence Sejnowski, Elizabeth Sikiaridi,**

**Jan Slaby, Paolo Virno, Frans Vogelaar, Sven-Olov Wallenstein, Bruce Wexler,**

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# From Noopower to Neuropower: How Mind Becomes Matter

Warren Neidich

## Primary Conditions: The Emancipation of the Pluripotential

In the societies of control, power relations come to be expressed through the action at a distance of one mind on another, through the brain's power to affect and become affected, which is mediated and enriched by technology. – Maurizio Lazzarato<sup>1</sup>

The implications of this statement go to the very core of the biopolitical questions that I would like to address in what follows. I will develop three lines of thought. First, in the transition from the disciplinary society to the society of control and onward to what Lazzarato refers to as 'noo-politics,' the focus of power and the technology at its disposal are not directed toward the materiality of the body, but, instead, its psychic life, particularly its memories and attention.<sup>2</sup> Important for reasons to be explained later, I will concentrate my discussion upon 'working memory.' As we will see memory is not the end of a process of retrieval but just the beginning. Memories are accessed and utilized to build a plan for future decisions and action.<sup>3</sup> This working memory is closely linked to the functions of the frontal lobes of the brain that play a crucial role in organizing these memories into temporal sequences that allow the human animal to enact behaviors in order to obtain future goals. This then is a related focus of this book; to understand the ways in which power has shifted its administrative focus, bypassing the senses to act upon the properties of the frontal cortex to intervene in its future plans. Secondly, I would like to extend this idea of noo-politics to include a new focus of sovereignty: that of neural plasticity itself and its potential as a generator of fields of difference. I am referring to this as 'neuropower,' especially when it administers the pluripotential of neuroplasticity in the *curating* of a homogenous people both in the present and future.<sup>4</sup> The noopolitical has an important role to play in this process as it arbitrates in the very process of attention which activates memory circuits in the end stabilizing neural networks. Furthermore, this neuroplasticity is now molded according to the new social, political, economic, and psychic conditions produced by post-Fordist deregulation, especially as it operates upon a 'delimited' workplace defined today by 'the sharing of linguistic and cognitive habits' occurring in a deterritorialized

1 Maurizio Lazzarato, 'The Concepts of Life and the Living in the Societies of Control,' in **Deleuze and the Social**, eds. Martin Fuglsang and Bent Meier Sorensen (Edinburgh: Edinburgh University Press, 2006), 186.

2 Ibid., 186. The Modulation of memory would thus be the most important function of noo-politics.

3 Elkhonon Goldberg, **The Executive Brain, Frontal Lobes and the Civilized Mind**, (New York: Oxford University Press, 2001), 72.

In most real-life situations we store and recall information not for the sake of recall itself, but as a prerequisite for solving a problem at hand. Here recall is a means to an end not the end. Furthermore, and this is particularly important, certain memories are accessed and retrieved not in response to an external command coming from someone else, but in response to an internally generated need. Instead of being told what to recall, I myself have to decide, which information is useful to me in the context of my ongoing activities at that moment.

4 Warren Neidich, 'Neuropower,' **Atlántica Magazine of Art and Thought** 48-49 (2009); Freek Lemma, Lia Gangitano and Sven-Olaf Wallenstein, **Warren Neidich: Lost between the Extensivity/Intensivity Exchange** (Eindhoven: Onomatopée, 2009); Warren Neidich, 'The Neurobiopolitics of Global Consciousness,' in **Sarai Reader 2006: Turbulence** (Delhi: The Director Centre for the Study of Developing Societies, 2006), 222-36; Warren Neidich, **Blow-up: Photography, Cinema and the Brain** (Los Angeles: DAP, 2003).

time/space continuum that ‘guarantees its readiness adaptability, etc., in reacting to innovation.’<sup>5</sup> As we will see shortly this ability of tertiary economies to react to and embrace change is ‘also dependent’ upon its close relationship to the activities of the frontal lobe.<sup>6</sup> New labor, like other cultural formations, such as Internet and social networks, is both a reflection and product of the evolution of machinic intelligence; one that by its prevalence and its intense power, especially over visual culture, but auditory and haptic cultures as well, becomes an important modifier of neurobiologic architecture especially its firmware embedded in synaptic connections and axon-dendrite circuitry and dynamic state variables encoded in the firing rates of neurons. The conditions of neuropower and its process of subjectivization are cognizant of these changes and have shifted their focus toward this ontogenic process. This text will elucidate the ways and means that sovereignty has insinuated its own extended cognitive apparatuses as epistemological agents and trajectories into the cultural habitus in order to call out to the multiplicity. This shift, delineated by a change of focus from the body to the brain and mind, especially its pluripotentiality, is described as neuropower, keeping in mind that the brain is part of the body and its malleability can be reflected in, for instance, body posturing. As Michael Hardt and Antonio Negri have pointed out, there is another side to biopower.<sup>7</sup> The role of art production as a means to counterbalance and challenge this power of the sovereign in the age of neoliberal global capitalism will form the subtext of what follows. Artistic practice, through its direct and indirect effect on the cultural field especially rerouting its memory and attention, can also activate the pluripotential of the neuroplasticity but with different results. In its most utopian guise it can emancipate the virtual contingencies locked up in the pluripotentiality of the pre-individual, itself a result of the tremendous variation of the neurobiologic substrate, sculpting inter-subjective difference and heterogeneity. For the purposes here I will elucidate the form of this emancipation through an exposition of the way that noise music, using the example of John Cage’s now famous, *4’33”*, has influenced the tastes of a generalized contemporary music appreciation.

**Virtuosity and Materialism** At this point, a digression to further analyze the evolving conditions of new labor and their implications for the ontogeny of the machinery of the brain and mind is necessary. Paolo Virno, arguing in *A Grammar of the Multitude* in view of Hannah Arendt and Karl Marx, suggests that in the information economy, the communicative act itself acts as an attractor repositioning political action, labor, and intellectual reflection closer to one another.

Let us consider carefully what defines the activity of virtuosos, of performing artists. First of all, theirs is an activity which finds its own fulfillment ... in itself, without objectifying itself into an end product, without settling into a

‘finished product,’ or into an object which would survive the performance. Secondly, it is an activity which requires the presence of others, which exists only in the presence of an audience.<sup>8</sup>

Furthermore, ‘I will maintain in particular, that the world of so-called post-Fordist labor has absorbed into itself many of the typical characteristics of political action: and that this fusion between politics and labor constitutes a decisive physiognomic trait of the contemporary multitude.’<sup>9</sup> This reference to physiognomy is interesting in two respects. First, it underscores the multitudes recognizable faciality, and, secondly, owing to the sophisticated technologies at hand, sovereignty is today able to judge the multitude. Beginning with Aristotle’s *Nicomachean Ethics*, Virno delineates the differences between what he refers to as labor (or poesis) and political action (praxis) through the idea of virtuosity distinguishing the former from the latter by the production of an object, in the case of poesis, and the lack of one, in the case of praxis. In praxis the purpose of the action is found in the action itself. Later, expanding his argument through Marx’s discussions in ‘Results of the Immediate Process of Production’ and ‘Theories of Surplus Value,’ he describes two kinds of intellectual labor.<sup>10</sup> Firstly, he characterizes a form that produces products of mental activity like books and paintings as well as instances in which the products and acts of producing them are inseparable from the act itself. Secondly, he specifies labor as the virtuosic performance leaving no real product or trace. Here, he includes pianists, dancers, orators, teachers, and even butlers. Yet, unless that speaker is speaking to himself or herself, an act considered somewhat odd and demented when it addresses no one yet occurs in the context of others and which is therefore deflected by possible recipients as non-sense, or self-reflexive when it is part of a singular and lone rehearsal, his or her speech finds a receptor-listener. This is essential to recent theories of mind referring as they do to our ability to form insights into what other people are thinking in order to anticipate their behavior. Deception is an important attribute of such a theory in which the deceiver manipulates the mental states of another person in order to later exploit them. When that listener is not one but many, every speech act finds, creates, or produces an audience. This need for an audience or a social mind as a roving, wet, mutable organic interface, where the inscription of the oral history/memory of that performance is inscribed in both the static and dynamic conditions of the material brain, figures as the central key to what follows. The virtuoso performance does in fact produce a material change, and can therefore leave a trace as mental sculptures and architectures. The production of such traces shape the essences of neoliberal capitalism and new labor.

5 Paolo Virno, *A Grammar of the Multitude*, translated by Isabella Bertolotti, James Cascaito and Andrea Casson (New York: Semiotext(e), 2004), 41.

6 ‘When the task (saying an appropriate verb to a visually presented noun) was first introduced, the blood flow level in the frontal lobes reached its highest level. As the subjects’ familiarization with the task increased, frontal lobe involvement all but disappeared.’ Goldberg, *The Executive Brain*, 69.

7 ‘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.

8 Virno, *A Grammar of the Multitude*, 52.

9 *Ibid.*, 50.

10 *Ibid.*, 56.

When the agency of this neoliberalism focuses directly on the conditions of cognition in all its variety, a set of conditions arise that I shall refer to as neoliberal cognitive capitalism. I argue that the essence of new labor acting in concert with the political, social, and cultural habitus with which it interacts, produces new forms of neural efficiency, both local and global, micro and molar, occurring in the circuitry of the brain.

**The Whatever of Neuropower** Although the expression neuropower and its link to neoliberal global capitalism to produce neoliberal cognitive capitalism is a rather recent phenomena, their roots can be traced to earlier times and epochs. Agamben alludes to the conditions of neuropower when discussing Aristotle's *De Anima*. In a comparison between an architect and a child, he states that the architect has the potential to build as the poet has the potential to write poems. He or she has the knowledge and can also decide not to make a work but instead to maintain that potential in an unused state. On the other hand, the child differs, as it has a generic form of potentiality. The child must 'suffer an alteration (a becoming other) through learning.'<sup>11</sup> It is this alteration that is the essence of the administration of the pluripotentiality of the nervous system. In its desire to create a people who share similar cultural and linguistic traits, the child's neuroplasticity must be curated and in doing so the child's possibility to become another or many is inhibited. Previously this process of alteration was done at the level of the senses and, as I will argue later, through the production and administration of the conditions of what Jacques Rancière refers to as the distribution of the sensible to which the senses are coupled. Through the action of the police, or through the apparatus of policing, this distribution is stabilized, and the agency of governing and administering becomes dislocated from, for instance, its courts of law, to the distribution itself. This is not to admit that the courts of law are no longer necessary but to understand them anew as part of a complex field of administrative apparatuses. The normalizing effect of the ways and means whereby the sensory environment is structured regulates those that move within it in accord with its sensory, perceptual, and cognitive apparatuses. It is an ontogenetic and developmental process. In the case of the child, the mediating efforts of the parents, communicated as a series of performances, first to the child as actions such as pointing and later through language, create the cognitive structures and mental routines with which it will think about itself and the world.

The new tools of neuropower no longer address simply the conditions of the sensory world and the perceiving static or mobile subject, but, instead, directly engage with those parts of the brain that are responsible for planning and making future decisions. I am referring to the prefrontal cortex and frontal lobe, which are located in the anterior and superior part of the brain. The new top-down strategies being developed join the historic bottom-up strategy to engage the whole mind in its entirety in the present the future. We might say, in fact, that

noopolitics directly engages a bottom-up strategy producing local changes in, for instance, the primary cortical areas that, through long-term connections and dynamic synchronous oscillations, inadvertently affect higher cognitive areas like the frontal cortex where abstractions about the world are formed and implemented. This is especially interesting when one considers that the maturing of the brain begins in the primary cortices and continues into the late teens in the frontal cortex. Noopolitics relationship to sensibility is defined as a passive tele-visual like process and concerns seduced attention leading to passive tele-visual memory. Neuropower has shifted this engagement of the subject to one that is now active and mobile under the umbrella condition of what is referred to as top-down processing, whereupon it operates directly on the higher cortical functions of, chiefly, the forebrain with its prognosticating functions and, secondarily, affects incoming data from the bottom-up pathways. 'In Haken's system of synergetics, emergence through self-organization has two directions. The upward direction is the local-to-global causation, through which novel dynamics emerge. The downward direction is a global-to-local determination, whereby a global order parameter "enslaves" the constituents and effectively governs local interactions ... There is no supervisor or agent that causes order; the system is self organized.'<sup>12</sup> It is with these tools that the multitude, which Thomas Hobbes had felt unmanageable, can now in fact be regulated. But as we noted above, biopower has another side, whereby, its new forms, for instance those producing Empire, constitute new conditions of resistance as well. This is also true of neuropower. I will leave this discussion for the latter part of this text.

**The Distribution and Redistribution of the Sensible** Even though spontaneous brain activity emerges without an external force, for a brain to be useful it should adapt to the outside world. The brain has to be calibrated to the metrics of the environment it lives in, and its internal connections should be modified accordingly. If the statistical features of the environment reflect one particular constellation, the evolving brain should be able to adapt its internal structure so that its dynamics can predict most effectively the consequences of the external perturbation forces. A great deal of this adaptive modification for each individual brain (its smartness) comes from interactions with con-specifics, that is, other brains.<sup>13</sup>

Jacques Rancière, in *The Politics of Aesthetics*, describes the 'distribution of the sensible' or *le partage du sensible* as the 'implicit law governing the sensible order that parcels out places and forms of participation in a common world by first establishing the modes of perception within which these are inscribed.'<sup>14</sup> Implicit in this statement is that sovereignty, the entity, whether absolute or popular, local or global, that has jurisdiction over a territory or group of people, produces a system of perceptual facts that are regulated and, in turn, regulate its constituents as perceptual bodies

11 Giorgio Agamben, **Potentialities: Collected Essays in Philosophy**, translated by Daniel Heller-Roazen (Stanford, Stanford University Press, 1999).

12 Gyorgy Buzsáki, **Rhythms of the Brain** (Oxford/New York: Oxford University Press, 2006), 15. This terminology is not unlike that found in a cultural studies textbook describing the conditions of global commerce or new forms of colonization.

13 Virno, **A Grammar of the Multitude**, 23.

14 Jacques Rancière, **The Politics of Aesthetics**, translated by Gabriel Rockhill (London: Continuum Press, 2004), 85.



molding them into a concrete and uniform entity.<sup>15</sup> Rancière also includes times and forms of activity in this distribution.<sup>16</sup> In the end, who sees or hears what or decides to move through what spaces in time designates either their inclusion or exclusion. For instance, those who can afford slow dial-up Internet service versus those who can afford fast DSL wide bandwidth service will determine what some individuals can know and what others cannot, as well as who may or may not have access to simultaneous and multiplicitous time, responding and negotiating complex digital relations in collapsed spaces within existent global networks. Furthermore, Rancière understands the important position aesthetics plays in the production of this distribution and its redistribution, because aesthetics has much to say on what is sensed. Utilizing the classic ideas of Kant's aesthetics as a system of a priori forms determining what presents itself to sense experience, he sees it in a political sense as a form of experience that must be controlled through governmental agency and for which art has a destabilizing effect. 'The aesthetic regime of art puts this entire system of norms into question by abolishing the dichotomous structure of mimesis in the name of a contradictory identification ... It thereby provokes a transformation in the distribution of the sensible established by the representative regime ...'<sup>17</sup>

In agreement with Rancière, I will discuss how artists and architects, utilizing their own histories of production, spaces of presentation, apparatus, methods, and materials, create an alternative distribution of the sensible, a redistribution of sensibility that has implications for noopower and neuropower. This redistribution occurs in the organization of stable matter in the form of the positioning of objects, as well as in the dynamic conditions they produce from the pathways for ambulation to regimes of visual attention. Through a nebulous cloud of abstract knowledge that circulates in and around these material essences, formed as they are by the multiplicity of stories attached to them, they create the metaconditions of their reception. From the story of their making to their constant redefinition in historical trajectories as metaphors in transhistorical mythologies and then to their current use in branding networks, object meanings play important roles as mediators of a distribution of the insensible as well. How light are these objective and vital essences and how nimble are they in dynamic trajectories that link one metahistory to another: as meaning itself jumps great divides on the waves of cultural contexts to bind meanings together into assemblages and link what was formerly non-assimilable to grand narratives. These entities then have the potential to produce unseen and immaterial linkages that tether cultural logics to temporal structures both in the world and in the brain that must comprehend them. The dynamic patterns in the man-made milieu, in their material and immaterial agencies, find counterparts in dynamic neural architectures, such as oscillatory potentials and assigned temporal signatures, which must code and understand these dynamic conditions.

Even though spontaneous brain activity emerges without an external force, for a brain to be useful it should adapt to the outside world. The brain has to be calibrated to the metrics of the environment it lives in, and its internal connections should be modified accordingly. If the statistical features of the environment reflect one particular constellation, the evolving brain should be able to adapt its internal structure so that its dynamics can predict most effectively the consequences of the external perturbation forces.<sup>18</sup>

**From Noopower to Neuropower** In order to address the first question of this text, I would like to begin with a quote from Maurizio Lazzarato, a second generation 'Operaist,' who recognized this new biopolitical dimension as defined by such terms as 'mass intellectuality,' 'immaterial labor,' and 'general intellect.' These concepts are recontextualized in terms of the new nature of productive labor and its living development in society.

In order not to name such different things with the same word, one could define the new relations of power which take memory and its conatus (attention) as their object ... noo-politics. Noo-politics (the ensemble of the techniques of control) is exercised on the brain. It involves above all attention, and is aimed at the control of memory and its virtual power.<sup>19</sup>

Agreeing with Foucault, but using a poststructuralist scrim, he still believes that sovereignty is interested in exercising its power by neutralizing difference with repetition in order to reduce the power of variation (the difference that makes a difference) by subordinating it to reproduction. The function of the training of bodies is to prevent the bifurcation, to eradicate any possibility of variation, any unpredictability, from action, conduct, and behavior. In the field of the society of control, conversely, the body is coerced through unseen and sublime mediated agents like radio waves and cinematic images that have no boundaries and enter the eye directly as invisible energy to administer consciousness. The unruly body/mind of the multitude in all of its possibilities must also be constrained and contained in the wide-open spaces of the world picture/movie/web. As such the new and more sophisticated technologies of the control of the mental at a distance are instituted. Today, radio waves have been replaced by software agents that produce Google profiles and the like. As we will see, the place of these bifurcations, variations, and unpredictability can also be found in the condition of the brain at birth that is, on one hand, a set of a priori genetic adaptations that allow for a minimal of survival and, on the other, consists of a stochastic, variable and overabundant, exuberant nervous system ready to be pruned, stimulated, and activated by the conditions of the environment, both natural and cultural. Repetition and constancy are powerful tools of this neural sculpting and are part of the institutional tools communicated first through

15 Gabriel Rockhill, 'Introduction,' in Rancière, **The Politics of Aesthetics**, 1.

16 Rancière, **The Politics of Aesthetics**, 12.

17 Rockhill, 'Introduction,' **The Politics of Aesthetics**, 4.

18 Buzsáki, **Rhythms of the Brain**, 15.

19 Lazzarato, 'The Concepts of Life and the Living in the Societies of Control,' 186.

the empathic gaze and nurturing touch of the parents as agents of understanding that shape this difference into a form of regularity.<sup>20</sup>

Paolo Virno sees the aspirations of neoliberal capitalism as vigilantly looking for new territorial markets and the potentials locked in the conditions of the nascent brain and mind with its limited/unlimited potential, its dynamis, as the next continent to discover and conquer. What might the future man or woman be, or how could they be produced? For the true conditions of the dynamis are most importantly found in the conditions of the production of the body-brain-mind-world axis. First, in the constantly mutating conditions of the urban cultural environment, especially those produced by modernism with its appetite for the new and the subsequent postmodernist inclination toward folded time and space. Then, as a response, these adaptive changes are first recorded and quickly emblazoned as patterns of neural connectivity – static and dynamic, hierarchical and non-hierarchical – in the forming brain. For as we progress up the evolutionary ladder, we find more and more of the brain, especially what are referred to as its association cortex, susceptible to the conditions of change and mutability. Peter R. Huttenlocher eloquently puts it this way.

While neural plasticity probably exists in the nervous systems of all species, it appears to be most marked in specific regions of human cerebral cortex, in areas that subserve the so-called higher cortical functions, including language, mathematical ability, musical ability and ‘executive functions.’ Regions of the cerebral cortex that subserve voluntary motor activity and primary sensory functions, such as visual and auditory information processing, appear to be less malleable.<sup>21</sup>

Key to what follows is a delineation of this special attribute of neuroplasticity along with the concomitant fast expansion of the frontal lobe and parieto-temporal areas that allowed humans to adopt to a plethora of natural and culturally induced environmental contexts in the end contributing to their evolution as *Homo sapiens*.<sup>22</sup> New histories for the production of the mind through differential sampling of the pre-individual are located not only intra-personally, in the life of that person, but are shared as the inter-personal social mind as well.<sup>23</sup> Enlisting the communicative industries, pharmaceutical corporations, military-industrial complexes, and the scientific community, sovereignty has produced sophisticated machine-ic assemblages to organize the distribution of the sensible to confer with the new conditions of the general intellect and the mind modes it produces that are free-floating and no longer anchored to singular and equivalent objects. I refer to this as cognitive ergonomics, because the contingencies of real and ‘potential space’ of the cognitive apparatus of the brain, its neural plasticity, have been elaborated to meet the demands of the constructed hegemonic social/cultural dynamis with a maximum of efficiency.<sup>24</sup>

## Cultural Difference and the Sampling of Neural Biodiversity

The most extensive modification to take place in human brain evolution – the disproportionate expansion of the cerebral cortex, and specifically of the prefrontal cortex – reflects the evolutionary adaptation to this intensive working memory processing demand imposed by symbol learning. So the very nature of symbolic reference, and its unusual cognitive demands when compared to non-symbolic forms of reference, is a selection force working on those neurological resources most critical to supporting it. In the context of a society heavily dependent on symbol use—as is any conceivable human society, but no nonhuman societies—brains would have been under intense selection to adapt to these needs.... This, then, is a case of selection pressure affecting the evolution of a biological substrate (the brain) and yet which is imposed, not by the physical environment, but ultimately from a purely semiotic realm.<sup>25</sup>

‘From the perspective of distributed cognition, this sort of individual learning is seen as the propagation of a particular sort of pattern through a community. Cultural practices assemble agencies into working assemblages and put the assemblages to work. Some of these assemblages may be entirely contained in an individual, and some may span several individuals and material artifacts.’<sup>26</sup>

Today more than ever, it is culture that has replaced nature as the primary force of epigenesis. Epigenesis is defined as the means by which the unfolding of the genetically prescribed formation of the brain experiences alteration by its interaction with the environment. When one considers brain function in this context, the term neural plasticity is used. Neural plasticity refers to the ability of the components of neurons, their axons, dendrites, and synapses, plus their extended forms as neural network systems, to be modified by experience. The neurobiologist Marcus Jacobson defined neural plasticity as a process through which the nervous system adjusts to changes in the internal and external milieu. Adjustments in the internal milieu can occur after brain injuries. For instance, a child is able to recover the function of language production and reception after trauma or stroke to the left language hemisphere of the brain. The right hemisphere, not normally an active part of that system, is capable of being modified so as to assume these language functions with little deficit if the onset of left hemisphere dysfunction occurs at an early enough age. Adjustments can also occur in response to changes in the external milieu. The heterochronous unfolding of the genetically determined neurobiological time table creates what are called critical periods of development in which certain regions and systems of the neurobiological substrate are extremely sensitive to the conditions of, for example, the linguistic-cultural milieu that predispose

20 Bruce Wexler, **Brain and Culture** (Cambridge, MA: MIT Press, 2006), 102.

21 Peter R. Huttenlocher, **Neural Plasticity** (Cambridge, MA: Harvard University Press, 2002), 5.

22 Jean-Pierre Changeux, ‘Genes, Brains, and Culture: From Monkey to Human,’ in Stanislas Dehaene et al., **From Monkey Brain to Human Brain: A Fyssen Foundation Symposium** (Cambridge, MA: MIT Press, 2005), 83.

23 Virno, **A Grammar of the Multitude**, 79.

24 Warren Neidich, **Blow-up: Photography, Cinema and the Brain**.

25 Terrance Deacon, ‘Multilevel Selection and Language Evolution,’ in **Evolution and Learning: The Baldwin Effect Reconsidered**, eds. Bruce H. Weber and David J. Depew (Cambridge, MA: MIT Press, 2003).

26 Edwin Hutchins, ‘Distributed Cognition, IEBS Distributed Cognition,’ **Shifter** 16 (April 2010): 5.

it to language acquisition during a particular time window. And therein lies the bigger question of which language will be acquired of the 6,700 in the world that the child's brain has the potential to learn. Which one is actually learned depends upon the close coupling of the child's brain-mind to his or her linguistic field.<sup>27</sup> As we will see in what follows, this condition of neural plasticity will be key in understanding the rapprochement of Rancière's distribution of the sensible and its concomitant regulation of the pluripotentiality of the brain's neural plasticity. I will argue that the 'Institutional Stabilization' of the distribution of sensibility, crucial to policing that field and defining the new conditions of power, fulfills the necessary conditions to restrict the potential heterogeneity implicit in the pluripotent character of the neurobiological substrate resulting in the production of a people. When we focus our attention on the microcultural context of the work place and understand it as a form of restricted distribution of sensibility, as a controlled space and model to perceive in action, we begin to understand its historical effect on neuromodulation.<sup>28</sup>

As we advance historically from primary economies of extraction to those described as secondary, involved with manufacturing, to those involved in services defined as tertiary, we also move through different assemblages of sensational fields.<sup>29</sup> When the conditions of the information economy predominate, as they do in northern European countries and the USA, and the emergent forms of general intelligence that result are expressed as conditions of networked and distributed systems defined as intensive, as opposed to extensive, the possibility for intensive neural sculpting is great. Let us look deeper into the reasons why.<sup>30</sup>

Two conditions have implications for how we might understand the idea of general intelligence. In the 'Fragments on Machines' (1858), Marx understands the idea of general intelligence as 'a machine intelligence.' In the transition from artisanship to mechanized production of the assembly line, the unitary consciousness necessary for the crafting of the unique object is now linearly distributed throughout an assemblage of laborers who function in concert to produce the replicated and equivalent object now reproduced ad infinitum. This is extensive labor as it produces a similar product over and over again. The laborer is simply a cog in the wheel of production and is subsumed by the machine as simply a series of human mental linkages between the machine's mechanical organs.

But once adopted into the production process of capital, the means of labor passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery (system of machinery: the automatic one is merely its most complete, most adequate form, and alone transforms machinery into a system), set in motion by an automaton, a moving power that moves itself; this automaton consisting of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages.<sup>31</sup>

Their labor, fetishized into a series of partial acts that together produce the object and the machine, binds all their minds together diachronously and synchronously. Together, as a single entity, they produce similar objects as long as the machine functions correctly. However things can go wrong as comically dramatized in Charlie Chaplin's *Modern Times* (1936), where, while working on an assembly line, he becomes accidentally consumed by the machine. In the transition to a post-Fordist condition, this assemblage of individuals along with new forms of architecture, break up and are dispersed horizontally, distributed across multiple times and spaces bringing about products that are singular and unique. The reflective machine intelligence is therefore of a different kind; it is intensive. Today, the general intelligence – the machines and apparatuses that bind people together and the social processes thus engendered – are invisible, non-hierarchical, and distributed. The information thus generated reflects the conditions of this production. Hence, the collectivity of the human intellect is ultimately also evident in the machine, in Marx's words:

... are organs of the human brain, created by the human hand; the power of knowledge objectified. The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it. To what degree the powers of social production have been produced, not only in the form of knowledge, but also as immediate organs of social practice, of the real life process.<sup>32</sup>

As we will see in the age of information and mass intellectuality, it is, in fact, the form of information itself that sculpts neural plasticity. General intelligence here is then defined as the information produced by these mutating conditions of labor available to any population. As we saw earlier, extensive and intensive labor produces very different kinds of information, and it is this

27 Marcus Jacobson, *Developmental Neurobiology* (New York: Plenum Press, 1991), 26.

28 Alva Noë, *Action in Perception* (Cambridge, MA: Bradford Book, MIT Press, 2004), 1.

29 Alexander R. Luria, *Cognitive Development: Its Cultural and Social Foundations* (Cambridge, MA: Harvard University Press, 1976), 3. The following passage is particularly relevant: 'It seems surprising that the science of psychology has avoided the idea that many mental processes are social and historical in origin, or that important manifestations of human consciousness have been directly shaped by the basic practices of human activity and the actual forms of culture.'

30 How different is the distribution of the sensibility characteristic of extensive versus intensive culture? Intensive culture is defined by multiplicitous, non-linear, rhizomatic processes, immaterial labor as a virtuoso performance, the conditions of the social brain best illustrated by the folded, complex diagram containing degenerative information and hubs through which diverse streams of information can be temporarily assimilated. It is most characteristic of tertiary economies of which the information society is the product. Extensive culture on the other hand is defined here as a set of conditions that have been formed according to a different set of coordinates and logics like linearity, Euclidean geometries, the narrative, and reproducibility. It is characterized by arbor-like flow charts in which connections between points of a map are stable and intransient creating crystallized information structures that are equivalent.

31 <http://www.marxists.org/archive/marx/works/1857/grundrisse/ch13.htm-page 692>. Passage from the *Grundrisse* quoted in Gerald Raunig, 'A Few Fragments on Machines,' <http://transform.eipcp.net/transversal/1106/raunig/en>.

32 *Ibid.*, 3.

information, especially in its intensive form, that creates the conditions of neuro-modulation.<sup>33</sup> These conditions of distributed information are powerful attractors that can act as forceful regulators of attention and memory, thus constituting sites of noopower.<sup>34</sup> This noopower is what forms the basis for neuropower in which the brain's neural plasticity and its pluripotentiality to become, are the sites of power's interrogation. It is in this context that the sculpting of the neural plasticity, through assemblages of trajectories of attention, subsumed in the regulatory patterns of built space, with its implicit temporality and representational and presentational rationality, can occur. Whereas noopower concerns people perceiving in the present moment, a kind of primary animal consciousness, neuropower concerns the production of people in the future. What they 'could' become.

In the conditions of intensive culture, the representation of an object as something real and equivalent is substituted by its branded value whereby its nature is determined by the stories that orbit around and through it the relations those stories form with other stories orbiting other objects to create the complex non-equivalent conditions of its brand equity. The crunchy edible matter in a box of cereal is not what creates its value, rather it arises from the way that the information on the box design excites a concomitant 'considered' neural architecture sculpted over time by a complex assemblage of previously designed contexts that the individual has experienced before in which other cereal boxes played a role and into which this new box is substituted. The cereal box is reinstalled ad infinitum into a system of recategorical memory that creates an active site for its infinite retrieval in the mind's eye of both real and imaginary. Rather than linear equivalence that organized and delineated the ecology of objects in an artisan economy and began to dissolve in a Fordist one, what defines the post-Fordist landscape of cultural objects is a nonlinear condition of value that is formulated by conditions of communicative labor as it functions along the distribution channels of media and hypermedia. As we will see shortly, general intelligence according to the model I would like to develop is a condition of the ratio between the apparatus of cognitive capital and cultural capital. Different cultural contexts allow different expressions of each thus having implications for the production of a people or multiplicity.

**The Cognitive Capital/Cultural Capital Ratio** Cognitive capital here is defined as that 'information distribution and production system' centered around knowledge and utilized by sovereignty and the conditions of the administration of normalcy which produces a system of homogenized thinking. Cultural capital was first designated by Pierre Bourdieu, but it operates here in the context of the ways and means through which artists using their own materials, practices, histories, apparatuses, critiques, performances, spaces, and non-spaces produce objects, non-objects, and activities that, when assembled in the cultural landscape, mutate the conditions of that landscape and produce resistant paradigms, or, as we shall see, abnormal epistemologic trajectories. It is at the intersection of

these mutating conditions expressed as a resultant cultural referendum that the brain and mind are hailed by different attention concoctions activating different neurologic toolboxes. The 'Global Workspace Theory' elaborated by Stanislas Dehaene and Claire Seargent is a case in point.

The global neuronal workspace theory tries to account for these essential properties by emphasizing the role of long-distance reciprocal connections among brain areas. According to this theory, conscious processing crucially involves a set of neurons, the 'workspace' neurons, which can work in synergy through long-distance reciprocal connections. Those neurons, which can access information, maintain it online, and make it available to virtually any other process, although particularly numerous in frontal-parietal areas, are distributed throughout the brain, thus constituting 'global workspace.' This state of global availability is, according to the theory, just what is to be conscious of a piece of information ... The particular set of workspace neurons involved in this mutual amplification process at a given time, would code for the current conspicuous content, and would delineate the possibilities of conscious manipulation, intentional actions and reports.<sup>35</sup>

According to this theory, only a single representation can be processed sufficiently by the workspace at any time leading to its being conscious whilst the other competing stimulations remain implicit or unconscious.<sup>36</sup> Thus the relationship between cognitive capitalism and cultural capitalism, as it influences, first, the conditions for cultural attention – what is culturally important – and, subsequently, through activating specific conscious representations, as in the global neuronal workspace, has implications for what the brain and mind will remember and therefore how the brain itself will be formed. One might say that in the transition from Neoliberal Global Capitalism to Neoliberal Cognitive Capitalism a reordering of the cultural landscape occurs in which an intensification of selective stimuli (as opposed to others) results in making certain stimuli more user-friendly to the global workspace apparatus. Cognitive ergonomics as an institutional apparatus then becomes the set of rules through which the cultural landscape is modified to fit the conditions of the epigenetically revealed cognitive apparatus. This, I would like to suggest, has implications for the production of the history of thought itself.

The neuronal recycling hypothesis provides us with the next step in this logical process and is an important key as to how long term changes might occur in the presence of sustained cultural niches. Cultural acquisitions like, for instance, reading (don't forget writing and reading are a fairly new abilities occurring in Mesopotamia approximately 3,500 BC), must find their neuronal niche, defined here as a set of already existing neuronal circuits which have functions that can be easily adapted to the newly required function and are sufficiently plastic, thereby able to change if

33 Gilles Deleuze, **Francis Bacon and the Logics of Sensation**, translated by Daniel W. Smith (London: Continuum Press, 2003), 102.

34 Maurizio Lazzarato, 'The Concepts of Life and the Living in the Societies of Control,' 186.

35 Claire Seargent and Stanislas Dehaene, 'Neural processes underlying conscious perception. Experimental findings and a global neuronal workspace framework,' **Journal of Physiology Paris** 98 (2004): 379, 380.

36 Ibid., 381.

need be.<sup>37</sup> At the crossroads of competition and cooperation expressed by this ratio, the brain and mind are formed.

### Neural Constructivist-Neural Darwinism: Sculpting the Brain and I Don't Mean Like Rodin

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 ...<sup>38</sup>

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 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 three sources. First, I shall engage the theory of neuronal group selection as formulated by Gerald Edelman to discuss the conditions of neuronal sculpting.<sup>39</sup> Secondly, the theory of neural constructivism, formulated by Steven R. Quartz and Terrence J. Sejnowski, will be essential in understanding the process of complexification.<sup>40</sup> I shall argue that these ideas, often considered contradictory, can be understood as complementary. Finally, I would like to pay tribute to the earlier theories of Jean-Pierre Changeux who laid the foundation for the comprehension of what is to come.<sup>41</sup>

Edelman's theory and that of Quartz and Sejnowski ask a basic question: What are the determinants of postnatal neural development? Is it, as neural Darwinism would suggest, an unfolding of a prescribed neurobiological process, in which a stochastic exuberant growth of neural elements is followed by a period of pruning and regression that through a Darwinian survival-of-the-fittest regime becomes sculpted by various 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. According to Quartz and Sejnowski, the weakness of this theory lies in its dependence on the notion of prespecification, as this theory necessitates that, for instance, the network must build in the problem domain a priori. But 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. Neural constructivism proposes that instead of simply a regression of neural elements, 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.'<sup>42</sup> 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 cognitive schemes for the construction of mental representations.'<sup>43</sup> 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. For our argument here, components of each theory will help us elucidate how nature or designed space might play an important role in the production of the neural architecture to be used in thought.

As we saw above, while neural Darwinism uses Darwinian paradigms of selection in the face of niche contingencies, neural constructivism recounts the ways and means by which age related cognitive improvements are the result of neural networks becoming increasingly interconnected, functionally more specialized, and sometimes progressively complex through the brain's relationship with the stimulating conditions of complex representational matrices of, for instance, the manmade built milieu. In this way neural constructivism is more Bergsonian. Firstly, evolution does not follow a single lone pathway, and its directions are not always with purpose. Thus, it remains inventive even in its adaptations.<sup>44</sup> Secondly, it is not always a movement forward in one direction but represents a process of diversification and sometimes disorder.

No doubt there is progress, if progress means a continual advance in the general direction determined by a first impulsion; but this progress is accomplished only on the two or three great lines of evolution on which forms ever more and more complex, ever more and more high, appear; between these lines run a crowd of minor paths in which, on the contrary, deviations, arrests, and set-backs, are multiplied.<sup>45</sup>

37 Stanislas Dehaene and Laurent Cohen, 'Cultural Recycling of Cortical Maps,' **Neuron Review** 56 (October 2007): 384-385. The neuronal recycling hypothesis consists of the following postulates: 1. Human Brain organization is subject to strong anatomical and connectional constraints inherited from evolution. Organized neural maps are present early on in infancy and bias subsequent learning. 2. Cultural acquisitions (e.g., reading) must find their 'neuronal niche,' a set of circuits that are sufficiently close to the required function and sufficiently plastic as to reorient a significant fraction of their neural resources to this novel use. 3. As cortical territories dedicated to evolutionary older functions are invaded by novel cultural objects their prior organization is never entirely erased. Thus prior neural constraints exert powerful influence on cultural acquisition and adult organization.

38 Tobin Harshaw, 'Can "No" Revive the Republicans,' **New York Times**, 26 March 2010.

39 Gerald Edelman, **The Remembered Present** (New York: Basic Books Inc., 1989).

40 Steven R. Quartz and Terrence J. Sejnowski, 'The Neural Basis of Cognitive Development: A Constructivist Manifesto,' **Brain Sciences** (2004), 1997.

41 Jean-Pierre Changeux and Stanislas Dehaene, 'Neuronal Models of Cognitive Functions,' **Cognition** 33/1-2 (November 1989): 63-109.

42 Quartz and Sejnowski, 'The Neural Basis of Cognitive Development,' 6.

43 Ibid.

44 Henri Bergson, **Creative Evolution**, translated by Arthur Mitchell (New York: Dover, 1998), 102.

45 Ibid., 104.

In this regard it is essential to remember the contribution of Francisco Varela, particularly his idea of enactive embodied cognition based as it is on the ideas of affordances, diversity, and natural drift. These are essential to our understanding of the means through which the mutating conditions of culture at the margins migrate centrally.<sup>46</sup>

For our purposes here, both theories and perhaps the two together operate well as a heuristic model, and, in addition, one compatible with the poststructuralist theoretical model I would like to elucidate. Cultural conditions are evolving, and they produce veracity and verification. The subunits of culture may evolve together or separately and these bound and synchronized cultural conditions produce and sculpt conditions of mind and brain to which they become coupled. These assemblages or props are historically derived and are embedded in the distributions of sensibility as cognitive gestalts hybridized to planned trajectories of thought. Along with the sculpted internal cognitive loops to which they are coupled, the cultural external circuit component completes the organic-inorganic assembled network. But like memory it is non-representational and re-categorical. These then are the building blocks of a complex field of such loops. When these loops are tethered together a hundred or thousand-fold and, as a result of their proximity and overlap form assemblages, their dynamic and emergent intensive conditions begin to be realized.

Neural Darwinism and neural constructivism in the end rely on the conditions of epigenesis, and, in this case, a cultural epigenesis, to produce or sculpt the neurobiological substrate into the neurobiological architecture to change the skin of brain into the flesh of mind.

Plastic human brains may nonetheless learn to factor the operation and information-bearing role of such external props and artifacts deep into their own problem-solving routines, creating hybrid cognitive circuits that are themselves the physical mechanisms underlying specific problem-solving performances. We thus come to what is arguably the most radical contemporary take on the potential cognitive role of nonbiological props and structures: the idea that, under certain conditions, such props and structures might count as proper parts of extended cognitive processes.<sup>47</sup>

As you will see, I view neural selectionism as the dominating force early on and neural constructivism more important later, keeping in mind that Darwinian forces may still play a role. All agree that a phenomenon of excessive growth of neurons in the early years of life is characteristically followed by a reactionary depletion. Neural constructivism attempts to account for what happens thereafter.<sup>48</sup>

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. I will cover developmental and experiential selection now, leaving reentry for later.

This 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 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 fetus's brain are well known. The combined effect of these three processes is the production of a neurobiologic common with which the brain will later engage with culture. 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. Variation that is a result the evolutionary experiments leading to the human nervous system that are still subsumed in the human genome and which under certain environmental stresses can become expressed. It is the degree of its variation in its primordial and plastic state that makes the primary repertoire relatively unspecified and to which '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 what I would like to refer to as the neurobiologic common or neurozoon. The Neurozoon embodies the full extent of the possibilities that a human brain can become and contains within itself all the evolutionary steps, some of which are now suppressed and not expressed at the level of the chromosome, that make up its ontogenesis. The Neurozoon awaits the moment of its unfolding not as a nativist series of heterochronous events emblazoned in the codon of the genome apriori, 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.'<sup>49</sup> 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 therein its complete his-

46 Francisco J. Varela and Evan T. Thompson, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, MA: MIT Press, 1991).

47 Andy Clark, *Supersizing the Mind* (Oxford: Oxford University Press, 2008), 68.

48 Quartz and Sejnowski, 'The Neural Basis of Cognitive Development.' See section 3.3 in the abridged edition of their essay in this volume.

49 Robert J. Scholes et al., 'Toward a Global Biodiversity Observing System,' *Science*, 321 (2008): 1044.

tory of neurobiological adaptations that were required in its ascendance as/to that species. 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 Bronx, You Atomic Human Toy* (2008), or paints feverishly, as in William De Kooning's *Woman* (1949). Both works depict bodies that are not formed perfectly, but contain many imperfections yet are still discernable as figures and, as a result, 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 toward 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 cognitive capitalism is a subset of neoliberal global capitalism and provides the precise mechanisms for this process of specified differentiation. For instance, it is feared that in a century, half of the 6,700 languages now active on our earth will disappear. Furthermore, design culture affects not only the early depletions and pruning of neural arborizations in the manner of a topiarist who clips the branches of thick bushes to produce wonderful fantastic shapes but also choreographs and guides the regrowth of the branches along prescribed pathways to produce specific shapes and forms. Neural Darwinism would be the topiarist while neural constructivism would be the choreographer. Further on, I will show how the homogenization of the cultural field by such conditions of the global economy as the International Style, franchise architecture, and computer generated designed architecture, restricts variation and, as a result, produces a crisis of neural network diversification leading to a crisis of the imagination. Therefore, neuropower is not simply about past evolutionary history but about its future history.

The secondary repertoire is a 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 which have repercussions for the material of memory interests us here.<sup>50</sup> 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, which have the potential to mutate the conditions of the neurobiologic architecture.

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 account is the result of a productive complexification and intensification. 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. Hebbian theory, which states that neurons that fire together wire together preferentially, is operative in the primary repertoire where spontaneous electrical activity stimulates genetically prescribed a priori networks.<sup>51</sup> In the secondary repertoire 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 than one object is present in a scene, several distinct assemblies should form. 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.<sup>52</sup>

In an intensive culture it is these dynamic codes that have become most important. Hebbian dynamics and neural Darwinism state that those neurons most intensely stimulated develop firing potentials that are selectively reinforcing whereas those not as stimulated undergo a process termed apoptosis and die out or manage to form connections with networks that are 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.

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.<sup>53</sup> They contain a number of different cell types that utilize different strategies for the processing of visual information like simple, complex, and hypercomplex

50 Virno, *A Grammar of the Multitude*, 70.

51 [http://en.wikipedia.org/wiki/Hebbian\\_theory](http://en.wikipedia.org/wiki/Hebbian_theory). 'Hebbian theory concerns how neurons might connect themselves to become engrams ... If the inputs to a system cause the same pattern of activity to occur repeatedly, the set of active elements constituting that pattern will become increasingly strongly interassociated. That is, each element will tend to turn on every other element and (with negative weights) to turn off the elements that do not form part of the pattern. To put it another way, the pattern as a whole will become 'auto-associated. We may call a learned (auto-associated) pattern an engram.'

52 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.

53 Semir M. Zeki, 'Cells Responding to Changing Image Size and Disparity in the Cortex of the Rhesus Monkey,' *Journal of Physiology* 242 (1974): 827.

cells, which all roughly share a common visual field.<sup>54</sup> As a unit, they are important in processing visual information and 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 hypothesis 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.'<sup>55</sup> This theory promotes neural development as a system that is said to be regressive and subtractive. 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.'<sup>56</sup>

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 Metroplitan Opera House and The Island City Central Park Gringrin, and Zaha Hadid's Hungerburg Funicular are cases in point. How then do these new spatial and temporal contingencies effect experiential selection? What then of the perceptual and cognitive habits, which 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 attention. 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 movie stars whose images adorn multiple platforms synchronously on billboards, lap tops, 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. Let us examine this relationship more deeply.

**Branding and Networks** Recently an image of a Pepsi Cola can occurred recurrently all over New York City on billboards of different sizes placed strategically for maximum visibility. The advertisement, not surprisingly, was effectively designed for maximum and rapid perception by both a pedestrian and auto-driving public. (Traffic jams slow automobile traffic to a crawl.) The color and design of the advertisement interestingly used strategies first found in the pop paintings of Andy Warhol, Roy Lichtenstein, and Robert Indiana. The advertisement was designed with a specific local context in mind in which other products advertised within the same visual milieu reverberated together producing a network of stimulation. Just like fashion, advertising is also subject to stylistic conceits and whether on purpose or not advertisements generally jive together. For instance in the past few years there has been a return to the imagery of the sixties with its rebellious content 'popping up' everywhere in commercials. In other words, the advertisement itself and its relation to other similarly designed advertisements in combination produced a cumulative intense effect upon the viewer. Such individual forms and their combined effect in the network where they are embedded produce correlated learning resulting in temporal coincidence at pre- and post-synaptic membranes in local and global cortical mappings that strengthen synapses in the brain. Furthermore, this advertisement occurred on multiple platforms distributed repeatedly on television screens and computer laptops throughout the planet simultaneously. As members of the planet earth, we are stimulated by global franchised sensations without national boundaries. National mindedness becomes transnational consciousness. These new contingencies provide the new affordances of the planetary urban environment, to use a Gibsonian term. Those neurons that code for these newly engineered affordances are coupled with these repetitive, intense stimuli and are therefore more apt to be favored over other neurons and neuronal networks in future encounters with those stimuli. In fact, these conditions of neoliberal capitalism make future encounters probable!

These stimuli can also be grouped together into larger ensembles of stimulation that are persistently aligned in the environment and thus are always coded together as a form of cultural mappings. Pop art created and still creates reverberations in not only in painting but in design, fashion, film, and architecture. Andy Warhol's factory was a creative facility that produced paintings and films but also elaborated styles and forms of behavior that corroborated with those occurring in the culture as a whole. Thus discovering the Velvet Underground and holding court

54 Charles Robert Noback et al., *The Human Nervous System: Structure and Function* (Totowa, NJ: Humana Press Inc., 2005), 340.

55 Quartz and Sejnowski, 'The Neural Basis of Cognitive Development,' 17.

56 *Ibid.*, abstract.



with other art star dignitaries at Maxes Kansas City created non-linear informational trajectories that found other lives in newspaper and magazine articles elaborating the events occurring therein. In other words, cultural mappings are intensive, delineated by a multiplicity of immanent social, historical, psychological, economic, and psychic relations that are collaged together forming a superstructure through which they can produce new conditions for understanding. Today, architecture and designed space, understood as both the physical conditions of built space and the immaterial virtual spaces of the Internet, house and support these elaborate amalgamations tethering them to learned activity trajectories, whether they are in the form of walking, driving or surfing the web. Through practice of these routines and internalization they form the habits of organized thinking itself.

There is an ecological logic to the forms of immanent distributions that are produced. Branded environments are one such example where through corporate agreements NIKE shoes, Post® Grape-Nuts, Hertz® Rent-a-Car, airberlin, and Sony Music Entertainment are bound together in the commercial landscape of billboards and airline magazines. (Cultural binding may share similarities to binding in the brain.<sup>57</sup>) The institutional understanding and sovereignty for which it does its bidding is empowered by this network of cultural signifiers.<sup>58</sup> What Paul Virilio had formerly referred to in the representational and extensive era as phatic signifiers today become fields of phatic signifiers embedded in the intensive logics of emerging meaning produced by the new apparatus of global culture.

Each brand is made up of its brand equity and its marginalities, both positive and negative, that together compete with other assemblages for the attention of the market place.<sup>59</sup> Brand equity is explicit; it is a real entity that can be quantified based on market studies, while marginalities are implicit and in the process of becoming.

Marginalities can become explicit under certain conditions. Vans shoes® were originally just leisure shoes to be worn all day. Their appropriation by skateboarders and their resultant popularity could never have been imagined. This skateboarding identity was originally external to its brand equity as a leisure shoe. As a result of a burgeoning cultural mutation taking place in Southern California that embraced and extended its explicit value that its brand equity grew. This became explicit when they were advertised as skateboarding shoes.

A new type of customer boosted the company's fortunes in the early 1970s. The skateboarding craze, an outgrowth of California's surfing culture, provided an opportunity for Van Doren to prove its flexibility. When skateboarders began requesting new colors and patterns, the company responded by offering the Era, a red-and-blue shoe designed by professional skateboarders. Vans quickly became the skateboard shoe of choice, beginning the company's

long, and devoted, association with the sport. Many more color combinations and patterns were added in the 1970s. A new style, the slip-on, was introduced in 1979, and it became the rage of southern California.<sup>60</sup>

Its brand equity continued to expand exponentially embracing more and more cultural marginalities that existed first at the periphery of its associational network and later emigrated toward the center of its brand meaning. In 1979, Vans association with skateboarding broadened its network through its association with, for instance, California style and life style, counterculture, and youth culture. This trend was further accentuated as Vans slip-ons gained international attention and appeal when they were worn by Sean Penn in 1982's iconic youth film *Fast Times at Ridgemont High*. Today those relationships have intensified and become more complex. The company is currently a subsidiary of an international company called VF corporation, which owns brands like Lee®, Wrangler®, The North Face, Gitano, Nautica®, Intima Cherry and Rustler®, to name a few. Its products are produced globally. A perusal of the Vans' website reveals that the brand forms a hub of remarkably diverse cultural relations. First of all, the original shoe line of three styles has now increased to a product line of 173. The classic line has been supplemented by a custom shoe line, as the company develops its brand to encompass the competitive professionalization of the sport with its star potential as well as satisfying the recent trend in marketing unique one-of-a-kind products (which also occurs in such custom publishing ventures as Lulu). The company no longer just makes shoes, but a whole host of other products such as backpacks, beach towels, shorts, gloves, eye glasses, travel bags, as well as watches and media products such as the film *Dogtown and the Z-Boys* (2001), now available on DVD on its website. Its website has global representation, and one can log on to different national sites, each sculpted to the specific tastes of countries such as Mexico, Argentina, the UK, France, the Czech Republic, as well as Japan, Korea, and New Zealand, to name a few. In 2010 the company will sponsor a touring concert called the 'Vans Warped Tour' featuring well-known bands and traveling to twenty-five cities nationwide. They are cosponsoring the tour with other companies like AT&T™ and Verizon to form linked branding. They are also teaming up with *Concrete Wave* magazine for its 'Concrete Wave Passport Program.'<sup>61</sup> Thus, as the company grew, it expanded according to the new proclivities of the global marketplace and the Vans shoe became undeniably linked to a plethora of other relations that on the surface seemed far away from a foot in a particular shoe. The physical shoe, a product of the secondary economy of real objects, made in the real world, and having equipotential exchange value, is now incorporated in the diagrammatic logic of the tertiary economy of information and branding where its value is tethered to the degree of attention it can accrue and hold so as to translate into its market share.

57 Giulio Tononi, 'Reentry and Cortical Integration,' in **Selectionism in the Brain**, 129.

58 Dehaene and Cohen, 'Cultural Recycling of Cortical Maps.'

59 Positive marginalities increase the brand equity by increasing the number of possible cultural and neuronal relations that are activated and activate the network that it defines and is the center of its constitution. Negative marginalities decrease brand equity by the opposite effect.

60 <http://www.fundinguniverse.com/company-histories/Vans-Inc-Company-History.html>.

61 <http://www.vanswarpedtour.com/warpedtour/news.asp>.

In postindustrial societies, attention has become a more valuable currency than the kind you store in bank accounts. The importance of linking products to celebrity culture and sponsoring rock music tours is a case in point. The problems for business people lie in both sides of the attention equation: how to get and hold the attention of consumers, stockholders, potential employees, and the like and how to parcel out their own attention in the face of overwhelming options. People and companies that do this, succeed. The rest fail. Understanding and managing attention is now the single most important determinant of business success. Welcome to the attention economy.<sup>62</sup>

Attention in tertiary economies is free floating and light. It moves along intensive distribution maps that are folded upon themselves in four dimensions. It is not crystallized and hierarchical although hierarchies are folded inside it. Attention is no longer captured but is rather a relational condition of information flowing through a place of confluent and related information at a particular moment in what is referred to as a hub, like a cloverleaf that connects many intersecting interstate highways. Attention no longer concerns a vanishing point in the Albertian perspective of a Renaissance painting. And it is no longer a place where the contingencies of a picture come together in what has been referred to as a 'punctum.' Attention arises in the flow of repeatedly distributed information that produces ever more defined traces out of the myriad of sensorial possibilities. As a result of the web logics of new labor, attention is multiplicitous, singular, unstable, and rhizomatic in the information economy.

The skateboard craze was a cultural phenomena that created selective pressures manifested as the desire to own and wear the shoe coupled with a broad array of ever increasing marginalities. The power of the brand and the attention it generated toward the shoe resulted from the size and shape of the map of that network, the brand equity/marginality complex, and the infinite array of relations contained therein. The power of the brand was not a result of the overriding administration of it from without, but from the relations that were generated inside it by the microconditions of its own substructure. The distribution of the sensible in the information society is the metacondition of these competing local brand equities, their competition for attention, and their relationship to the broader molar attention economy with which they interact. Each molar economy allows for different dispositions of attention to express themselves. The context is not equipotential, and some brands operate more effectively in certain environments than in others. The same might be said for political climates. Abortion rights advocates are able to voice their cause more effectively on FOX News or during conservative administrations. As such the nation for better or worse pays more attention. Of course, money and expenditure trump context; such is the case of political advertisements during local and national campaigns.

We might conjecture that a theory of marginalities possibly provides a new model for how neural networks in the brain gain traction. It potentially provides

a clue for how art, by creating and linking unforeseen relations between implicit and isolated marginalities to brand equity, perhaps mutates the reception of that entity thus altering its meaning. It might, by creating contrasting and altered meanings, provide the conditions of resistance that are adversarial to the power of institutions that administer the neuroplasticity of the brain and want to contain meaning. After the initial effulgent explosion of neural elements in the early days of postnatal development and the consequent sculpting and subtraction as a result of epigenesis that is the hallmark of the theory of neural Darwinsim, the consequent complexification of neural elements, networks, and maps might in fact be the result of a process similar to what we discovered operating in the cultural milieu. Just as we saw how marginalities migrated from the periphery of significance, far away from their brand equity, toward their central axis of denotation where they became important influences, neural networks might be tethered together through organized and stochastic relations to other neural networks and maps that they originally had no relation to at all. In the case of Vans, the accidental coincidence of skateboard culture led to a clothing and media empire in which the brand became extended to encompass shoes, shirts, DVDs, sports contests, and concerts. A recent limited edition run features vintage album art from such music innovators as the Sex Pistols. This is interesting in two regards. It matches two culture-bending iconoclasts in one brand. Hearing about this venture, seeing the shoes in the store, seeing celebrities wearing these shoes, and seeing them on posters corroborate their effect in cultural networks. Each time one of these alternative representations is perceived it causes reverberations in cultural and neural memory circuits directly and indirectly. Because of the phenomena of 'overlapping networks,' stimulation in one system leads to stimulation in another, the degree depending on the intensity of the stimulation and the closeness to the original pattern. Obviously, linkages to the Sex Pistols will cause intense attention and stimulation. Neural marginalities might also exist first as codes for culturally contrived elements that populate any intensive circuitry of meaning. As the brain codes for those conditions of the man-made milieu, so to would its changing patterns of excitation and inhibition mimic those occurring therein. Neural marginalities could be explicit or implicit. As the neural architecture becomes more and more complicated and complex, those neural elements that may not have played a role in a particular response repertoire, because they existed far outside the main route of the excitation pattern, may over time become part of the organizational complex and thus influence the overall energy distribution. This could have implications for later sculpting. We must remember that the degree of neural plasticity trans-cerebrally is not equal with primary cortices reaching their maximum plasticity early on while more associational cortices mature much later with the frontal cortex maintaining much plasticity until the late teens.

Perhaps a theory of marginality might be more operational later on. When understanding the brain as organized according to the intensive logics of the information society characterized by

new labor, one that is not hierarchically and arboreally arranged but rather chaotic and rhizomatic, then this theory becomes even more tenacious. We will discuss this more later but for now we can say the network configurations of the real/imaginary/virtual interface in the world today, produce similar arrangements of neural network configurations in the brain-mind. Intensive networks create an intensive brain; perhaps not in the stable configurations of its material elements, its dendritic spines, axons, and synapses, but in the restructuring of its dynamic potentialities. The conditions of cultural intensity integrate dynamic flows according to folded rhizomatic distributions of attention that these branded environments are instrumental in producing. Already existing oscillatory potentials, important for the production of the dynamic environment of the brain and its default state, each with their own character to transmit different kinds and bits of information internally, are piggybacked by the dynamic gestalts and rhythms at play in the cultural environment and with which branded equities are imbricated. It is these dynamic potentialities, as they are phase locked in ensembles synchronously, that create intense branded networks and are the focus of institutional administration. They are highly engineered with the brain's capabilities in mind and distributed over and over again in culture. It is this intensity and repetition that creates their attentive power and makes them a powerful tool in the hands of the state apparatus. These couple to networks in the brain-mind that first pay attention to them and then memorize them as a result of registering them preferentially, in the end having affects on the overall development of the architecture of the brain-mind. In the competition for neural space during critical periods of development, neural networks selected by these branded environments will out-compete those that are not selected, which either wither away or are incorporated in other assemblages where they can continue to play a role and be stimulated. Intensive networks can transmit more information than hierarchical assemblages and circuits because they are degenerative. As such they are more powerful sculptors of neuroplasticity.

Branded networks work directly and indirectly on the child's mind, which is especially malleable. Directly through sophisticated marketing techniques in which advertisements specifically engineered to target the child's mind are transmitted cross-culturally during Saturday morning cartoons as well as in the store windows of shopping malls and tethered to McDonald's Family Pack Cartons. (Remember that cultural sculpting has not yet taken place so that cross-culturally the differences are not as yet formed. For instance, black and white children play together without incidence until they are taught racism.) These specially designed advertisements are analogous to 'babyese,' in which parents prolong and exaggerate certain key phonetic distinctions coupled to the child's immature brain. The same holds true of childhood advertisements. Their bright colors, fantastic talking cartoon animals, and 'babyese' wording, which the child already knows from Saturday morning cartoon programs, create an indistinguishable set of signifiers in a

child who is as yet unable to distinguish him- or herself from others. This is where the society of control really begins in the inside/outside of the child's mind.

Still, there is another way that the conditions of capitalism are transmitted to the child – indirectly through the parents. Neuropower focuses on the planning and attention capacities of the frontal lobe. Adults assist children in the routines of their daily life that are beyond the capabilities of their immature brain. At first, through such activities as pointing, adults are indispensable in the early process of learning. Later, when these activities involve planned action, for instance, parents extend their children's abilities by acting and operating as agents of their frontal lobe.<sup>63</sup> This coupling of adult and child is a necessary condition of the early neural sculpting of neuropower. The parent functions at the service of institutional understanding, acting as its agent of neuromodulation. Nevertheless, perhaps in the future with more sophisticated computer interfaces and software agents, the parent won't necessarily serve as the surrogate forebrain. Andy Clark's *Mindware* suggests as much.

Imagine that you begin using the web at age 4. Dedicated software agents track and adapt to your emerging interests and random explorations. They then help direct your attention to new ideas, web pages and products. Over the next 70 years you and your software agents are locked in a complex dance of coevolutionary change and learning, each influencing and being influenced by, the other. In such a case, in a very real sense, the software entities look less like part of your problem-solving environment than part of you. The intelligent system that now confronts the wider world is biological-you-plus-the-software-agents. These external bundles of code are contributing rather like the various subpersonal cognitive functions active in your brain.<sup>64</sup>

**Time Never Won or Never Lost** 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. 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.<sup>65</sup> 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 and that 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 sub-cortical structure, to the cortex.

In some ways each of these areas sample and produce maps of the world based on their specific

63 Wexler, *Brain and Culture*, 108-9.

64 Andy Clark, *Mindware* (Oxford: Oxford University Press, 2001), 115.

65 Tononi, 'Reentry and Cortical Integration,' 129.

biased apparatus. For instance, area V<sub>4</sub> of the occipital cortex samples the world according to color, that is its cells are wavelength selective, while those of V<sub>5</sub> are motion selective.<sup>66</sup> 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. Referred to as binding, 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, cingulate 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 forth and so on. Reentry also plays a role in binding these regions as global mappings, as it refers to the whole brain activated at the same time. "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."<sup>67</sup>

An understanding of binding may be a key to phenomenological immersion – the feeling that when you are reading a book, watching a movie, or actively engaged in a virtual reality program, that 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. Neoliberal cognitive capitalism, through the elaboration of a set of epistemological trajectories, creates fields of bound signifiers in the form of brand alliances that call out to the brain-mind of its subjects producing, as we shall see shortly, synchronous discharges in the neurobiological architectures that are its correlates.

Architectures tuned to specific dispositions are sculpted upon this neuroplasticity. 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. 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.<sup>68</sup>

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. As we will see later on, art and architecture can facilitate this process as well as subvert it.

**Brainweb: Hierarchical vs. Distributed Networks** On the other hand, the mixing of times in the media, within the same channel of communication and at the choice of the viewer/inter actor, creates a temporal collage, where not only genres are mixed, but their timing becomes synchronous in a flat horizon, with no beginning, no end, no sequence. The timelessness of multimedia's hypertext is a decisive feature of our culture, shaping the minds and memories of children educated in the new cultural context.<sup>69</sup>

Neural assemblies provide a conceptual framework for the integration of distributed neural activity. For our purposes, neural assemblies will be defined as distributed local networks of neurons transiently linked by reciprocal dynamic connections. A useful analogy is found in World Wide Web systems such as BitTorrent™, in which geographically distant computers briefly transfer data to each other within transient assemblies that are formed on a static network of hardwired connections.<sup>70</sup>

There are two basic theories to the solution to the problem of integration in the brain. The first model is based on a hierarchical model in which there is a progressive increase in the specificity of the neurons as you move from the peripheral to the more central areas. Diverse processing streams achieve confluence at higher hierarchical layers finally reaching what is referred to as a master area. Such a master area has 'not' been found, although feed-forward convergence is an important anatomical feature of the cortex. An alternate model, which has broad implications for our understanding of the brain as a multiplicity, is the reentrant model of integration. The two main tenets of this theory are that neurons work together in 'neuronal groups' or local collectives and that they correlate their activity through reentry.<sup>71</sup> Importantly, reentry is not feedback, because unlike feedback, which occurs along a single fixed loop made up of recursive connections that contain

66 Semir Zeki, ed., *A Vision of the Brain* (New York: Blackwell, 1993), 126.

67 Thomas Metzinger, *The Ego Tunnel* (New York: Basic Books, 2009), 67.

68 Ibid.

69 Manuel Castels, *The Rise of the Network Society* (New York: Blackwell, 2000), 492.

70 Francisco Varela et al., 'The Brainweb: Phase Synchronization and Large-Scale Integration,' *Neuroscience* 2 (April, 2001): 229-39.

71 Gerald M. Edelman and Giulio Tononi, *Consciousness, How Matter Becomes Imagination* (London: Penguin Books, 2000), 85.

previous instructions for control and correction like a thermostat, it occurs across multiple parallel pathways, which are not pre-specified. Like feedback, reentry can occur locally and globally; however, reentry is ongoing, correlating signals from many areas into synchronized events. Reentry is like an orchestra minus a conductor. The 26-piece orchestra Orpheus performs without a conductor without difficulty and with surprising results.

Yet, despite these mercurial qualities, Orpheus has earned a reputation for performances that are not only enthusiastic and fresh, but which are often as well shaped and finely polished as many a more firmly established, conducted orchestra. On the surface, it would seem that fashioning orchestral performances without the guiding hand of a conductor should present both technical and interpretive problems, particularly in the post-Classic literature. But the success Orpheus has enjoyed raises several questions: Is a conductor really necessary? Or, conversely, can a musical interpretation be established by committee?<sup>72</sup>

Reentry is linked to the theory of neuronal group selection as it tethers and stimulates recurring and grouped disparate maps together according to repeated and regular internal or externalized stimulation. The more times that map is stimulated, the greater the efficiency of the flow of energy through that system. Many different combinations of neurons and neural groups can produce a similar response. This property is called degeneracy and describes the way that 'many different patterns of neural architecture are functionally equivalent.'<sup>73</sup> Degenerative networks in the brain describe functional equivalence despite structural difference, which means that a form of behavior can be elicited by a varied number of network configurations. It can protect the individual from traumatic insult in some situations, since alternative networks in a degenerative assemblage can be utilized to perform the same action using a different pathway. Nevertheless, it also means that one network can play different roles. In other words, neural networks can be isofunctional in some contexts and non-isofunctional in others. Complex environments are more degenerate. They have the possibility to create more kinds of patterns and configurations and, therefore, sculpt more degenerative brains, which can call on many more combinations of different and flexible networks for a given cognitive task. Degeneracy is an important component of the theory of marginalities, because it provides a mechanism through which formerly non-linked networks might join ongoing ones in schemas of participation. This might in fact create the potential for more creative minds.

Analogous to the conditions discussed earlier between brand equity and externality, the efficiency of a map is related not only to the strength of its relevance to the inciting stimulus, the original conditions of its formation and repetitive stimulation, but also to its potential to indirectly participate, along with its

fellow neuronal, synaptic, and dendritic components, in other maps. As a result of these multiple conditions of stimulation and firing, it develops neural efficiencies that give it an advantage over those not so stimulated in the competition for neural space in the brains anatomy during experiential selection. A neural-synaptic-dendritic selective potential depends not only on how it was initially formed but also by the 'alliances' it was able to form with other networks during the course of the history of its own plasticity. (Plasticity seen here as ontogenic.) 'In the visual system model ... entire cortical states and all of the cooperative interactions that lead to their establishment can be selected during reinforcement. This results in synaptic changes in many different pathways, including some whose involvement in the task at hand may not be immediately obvious.'<sup>74</sup>

Just as in economic systems, analogous but different network dynamics are operational in neural systems. When electrical discharges in different regions occur together and in register, one says that they are phase locked and synchronous. Synchrony and neural integration are properties of localized brain regions like the visual cortex, resulting in local binding, or when occurring throughout the brain disparate areas discharge together in large-scale synchronizations in global mappings.<sup>75</sup>

A global mapping is thus a dynamic structure containing multiple reentrant local maps (both motor and sensory) that interact with nonmapped regions, such as those of the brain stem, basal ganglia, hippocampus, and parts of the cerebellum ... Within a global mapping long-term changes in synaptic strengths tend to favor the mutual reentrant activity of those groups whose activity has been correlated across different maps during past behavior.<sup>76</sup>

Global mappings are intensive. Metastable coordination dynamics, which express the relation of multiple local tendencies nested in a global cortical condition, more accurately describes the temporal conditions of neural processing than older theories of simple linear phase dynamics, which only defined the relations of local areas to each other. Important for our discussion here is that 'metastability, by reducing the strong hierarchical coupling between the parts of a complex system while allowing them to retain their individuality, leads to a looser, more secure, more flexible form of functioning that promotes the creation of information.'<sup>77</sup> As opposed to other theories of phase dynamics such as multistable and monostable regimes, metastable coordination dynamics elucidate William James' famous description of the stream of consciousness as a series of perchings, or integrative tendencies, and flights, or segregative tendencies. Put another way, the former is important in the summoning and creating of thoughts while the latter allows one to be released from a thought in order to smoothly move on to another.<sup>78</sup> But the word perching implies that

72 Allan Kozinn, 'An Orchestra that needs no Conductor,' **New York Times**, 19 May 1982, Arts Section.

73 Gerald M. Edelman and Joseph A. Gally, 'Degeneracy and complexity in biological systems,' **PNAS** 24 (November 2001): 13763-8.

74 Giulio Tononi, 'Reentry and Cortical Integration,' 144.

75 Varela et al., 'The Brainweb: Phase Synchronization and Large-Scale Integration.'

76 Edelman and Gally, 'Degeneracy and complexity,' 95.

77 J.A. Scott Kelso, 'An Essay on Understanding the Mind,' **Ecological Psychology** 20/2 (2008): 194.

78 *Ibid.*, 200.

the bird, and by analogy the brain and mind, is never 'really' resting or committed to a set of thoughts, perceptions, or feelings, but is always simultaneously stationary and ready to move on without committing to either. Consciousness, by this definition, is fluid rather than phase locked and as such more accurately accounts for the seamlessness and continuity of the world.

The experiential world is a *mélange* of different temporal possibilities in which local activities take place in broader dynamic systems. It is not simply a stable system of dialectic contrasts, but instead a multitudinous flow of creative contingencies in transition as a few excerpts from the chapter 'Seen from the Window' of Henri Lefebvre's book *Rhythmanalysis* will illustrate.

Towards the right, below, a traffic light. On red, cars at a standstill, the pedestrians cross, feeble murmurings, footsteps, confused voices. One does not chatter while crossing a dangerous junction under the threat of wild cats and elephants ready to charge forward, taxis, buses, lorries, various cars. Hence the relative silence in this crowd ... Therefore the people produce completely different noises when the cars stop: feet and words. From right to left and back again. And on the pavements along the perpendicular street. At the green light, steps and words stop. A second silence and then it's the rush, the starting up of tens of cars, the rhythms of the old bangers speeding up as quickly as possible... The harmony between what one sees and what one hears (from the window) is remarkable. Strict concordance ... Two-minute intervals. Amidst the fury of the cars, the pedestrians cluster together, a clot here, a lump over there; grey dominates, with multicoloured flecks, and these heaps break apart for the race ahead. Hard rhythms: alternations of silence and outburst, time both broken and accentuated, striking he who takes to listening from his window, which astonishes him more than the disparate movements of the crowds.<sup>79</sup>

Neither is time linear, going from one point to another as in a differential equation, but rather it exists simultaneously and diachronically in multiple planes that intersect in an infinite array of possibilities. It is a topologic surface containing infinite combinations of folded time ready to be discovered.

Other, less lively, slower rhythms superimpose themselves on this inexorable rhythm ... the flows and conglomerations succeed one another: they get fatter or thinner but always agglomerate at the corners in order subsequently to clear a path, tangle and disentangle themselves amongst the cars ... The linear, which is to say, in short, succession, consists of journeys to and fro: it combines with the cyclical the movements of long intervals. The cyclical is social organization manifesting itself.<sup>80</sup>

by these evolving temporal conditions. The term 'evolving' is key here. As we have already suggested the appreciation of time is ontogenic. We use only a small portion of the possible conditions of time. Our sense of time is restricted, on the one hand, by our own anatomies, what Edelman has called our values, and, on the other hand, by the machines we build to use it and the philosophies we have invented to contemplate it. Artistic experiments like futurism and cubism, in the early part of the twentieth century, and minimalism, kinetic art, pop art and intermedia performance-based art, later on, opened up and made concrete these other temporalities. Art has emancipated time. A metastable paradigm of brain rhythms allows for this complex developmental nature of the appreciation of time. Our understanding and use of time can open up beyond its present day usage because of the malleability of the dynamic conditions of neural functioning, which is able to respond to its novel elaborate constancies, for instance, in built space, and to form meaning from its inconsistencies as well. Let us here retreat to some concrete examples.

**Art-Power** At the beginning of this essay, I mentioned that like biopower, neuropower was instituted according to two simultaneous processes. Much of this essay concerned the institutional administration of the neuroplastic potential. This normalization of difference is the first process. Cultural creatives, in all their many forms as visual artists, poets, dancers, musicians, cinematographers, and so on, have the ability to play a role in the production of resistant regimes of visibility, for one, which can compete for the brain-mind's attention leading to reactions and effects in the molding of the neuroplastic potential. The power of art is to create or recognize marginalities in cultural milieus and bring them forth, creating disparate and competitive networks in cultural potentials that can affect the brain's neural potential. Artists, in the most utopian sense of the word, using their own materials, practices, histories, critiques, spaces, and apparatuses 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.

Think here for a moment about the relationship between Mozart's *Sonata for Two Pianos in D Major* made famous as 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.<sup>81</sup> 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.'<sup>82</sup> Finally, 'perhaps the cortex's response to music is the Rosetta Stone for the code or internal language of higher brain function.'<sup>83</sup> Even so, Shaw and company are forgetting an important consideration. We don't

79 Henri Lefebvre, *Rhythmanalysis*, translated by Gerald Moore and Stuart Elden (New York: Continuum Press, 2004), 28-9.

80 *Ibid.*, 30.

81 F.H. Raucher, G.L. Shaw and K.N. Ky, 'Music and Spatial Task Performance,' *Nature* 365 (1993): 611.

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

83 *Ibid.*, 108.

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.<sup>84</sup>

Like modernist observers experiencing the postmodern space of the Bonaventure Hotel 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 works of art were sublime and beyond the sensing capabilities of their neurobiologic apparatuses.<sup>85</sup> 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, improvisation and free music, operate, in fact, in an 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 practicing 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.'<sup>86</sup> Each instrument plays its own score adapted to its own proclivities and idiosyncrasies. 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 sure, produces ruptures and asynchronies. How different is the following quote to what we heard above from Gordon L. Shaw, '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.'<sup>87</sup> One might then ask is the question: How does noise and improvisation become sensible? Referring to Csaba Toth in the same collection of texts, he refers to noise 'as the other side of music and everything outside the discipline, literally encompasses what hasn't been discovered as music yet.'<sup>88</sup>

What was it like for an audience to first hear a John Cage performance? 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 the American avant-garde composer. 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 throughout the three movements (the first being thirty seconds, the second being two minutes and twenty-three seconds, and the third being one minute and forty seconds). 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 opened the keyboard lid and sat silently for thirty seconds. He then closed the lid and the 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. Finally he closed the lid a last time and walked off the stage.

Although commonly perceived as 'four minutes thirty-three seconds of silence,' the piece actually consists of the sounds of the environment that the listeners hear while it is performed. Over the years, 4'33" became Cage's most famous and most controversial composition.<sup>89</sup> The piece pushes the listeners outside the presumed concert and the usual regime of attention, to listen instead to the pure ambient sounds outside marginalities that linger on the periphery like a collective unconscious: a pencil dropping, the breathing and coughing of others, one's own heartbeat as a result of one's own intimidation. These personal sounds become the musical score. More importantly, this work follows in Cage's overall investigation of time. This work, by stripping the music of its musical score and laying bare its temporal underbelly, conflates time. Time is stretched and without its musical bearing the audiences appreciation of time is disrupted.

Moreover, for anyone going to a concert by John Cage or listening to hardcore noise in a venue like Staalplaat in Berlin's Neukölln district, there is a learning curve and, as such, much disagreement in the general population as to its merit. What at first sounds dissonant and totally non-sensical becomes understandable. 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.'<sup>90</sup> But noise as well as free music and improvisation are not for everyone, even though another human brain has made it. Do these changing musical tastes imply a more subtle and flexible dynamic organization, one that, for instance, coordination dynamics and a metastable theory of neural processing, when superimposed upon a subpopulation with an unabated neural plasticity, might make possible? Are these differences in the degree of neural plastic potential analogous to the differences we find in inter-individual 'cognitive reserve' in which people with similar degrees of severity of neurodegenerative disease manifest the degree of dementia with considerable variability? I have already discussed the considerable variability between individuals both in their anatomy and brain wave

84 <http://www.classicalnotes.net/columns/silence.html>.

85 I refer to this as the neurobiologic sublime.

86 Anthony Isles, 'Introduction: Noise and Capitalism,' *Kritika* 02 (2009): 14.

87 *Ibid.*

88 *Ibid.*

89 <http://en.wikipedia.org/wiki/4'33>".

90 Buzsáki, *Rhythms of the Brain*.

patterns both in the primary and secondary repertoires. The appreciation of noise and improvisation was initially for a select and sampled population, one that is continuing to enlarge and contaminate the tastes of a larger more general population becoming more and more 'the' preferred form of music now listened to. Many individuals pay money to go see bands play, visit venues where they can be found, and buy and exchange CDs or MP3 audio by their favorite artists even though it is hard to hear any noise music on popular mainstream radio or MTV. Certain artists like John Wiese in his recent album *Circle Snare* are breaking this pattern and adapting noise and mixing it with punk to engage mainstream audiences. Perhaps noise, more than simply a form of resistant experience, coheres to a population of brains whose perceptual habits have been formed according to a different perceptual 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 but have yet to join the contemporary cultural zeitgeist. Just as the brain uses miniscule portions of its temporal potential, culture's underutilized potentiality is the cause of its constant shifting and mutability.

Perhaps those who are the first to appreciate noise music are a group of individuals who prefer 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 perhaps our culture has itself tuned its pattern recognition toward 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 as billboards framing public spaces. Patterns that are implicitly activated in 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 or in the particulate diffusion of spectacular light seen in the explosion of a building videotaped and then edited in After Effects CS-5 as action, stop action QuickTime movie downloaded on YouTube or even played in reverse! On the other hand, home video programs on laptops like Final Cut Pro and iMovie allow everyone to be a filmmaker. Everyone is an artist, as the technologies have made once difficult skills easier and widely available. 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 found on YouTube as well as being incorporated 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) wherein the screen is divided in four to depict different stories unfolding simultaneously.

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 toward 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. Such cognitive regimes constitute what Piere Bordieu 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.<sup>91</sup> Are these then the new dynamic cultural signifiers determined by Hollywood, the attention attractors for a new generation? Perhaps it is an anesthetics of decay and destabilization that is now drifting through a population of psychic vampires hungry for new forms of sensuality and entertainment.

**Perception in Action** In the past 50 years, classical theories of experimental psychology, cognitive psychology, cognitive science and cognitive neuroscience, which viewed perception as a passive stimulus driven device that reacts to sensory information and copies pre-specific information to create meaning, has given way to one that is more active and adaptive. (Many, like J.J. Gibson, never accepted this idea.) The earlier model depended on the hierarchical system that organized space and time extensively and was believed to deliver and produce an internal world model that was a representation of a stable and context invariant external environment. As we saw above, perception is built from tiny bits that are assembled into more and more complex entities as one moves up the hierarchy.

A new model called situatedness has been applied to a much more adaptive and action oriented system.<sup>92</sup> Situatedness assumes that cognition is not built on context invariant models, but instead must adapt itself to the continually changing environment – that of the moving subject imposing himself or herself on a nervous system in action. Cognitive functions are now being appreciated more in terms of top-down strategies rather than bottom-up strategies of classic neuroscience, although bottom-up strategies are still understood as playing an important role. This top-down strategy has shifted the concept of perception away from reflex driven systems of reactivity to one that is expectation driven, derived from previous experience. As Wolf Singer understands it:

These indicated that synchronized oscillatory activity is not only stimulus driven but does occur across widely distributed networks of interconnected cortical areas in anticipation of an attention demanding discrimination task. This observation led to the hypothesis that self-generated oscillatory activity in the beta and gamma frequency range could be a correlate of an executive subsystems required for the execution of the anticipated task.<sup>93</sup>

This new shift toward expectation has implications for models of neural systems in the information age because perception is now 'dominated' by intrinsic factors such as attention, memory, and expectation.

91 Jean-Pierre Changeux, *The Physiology of Truth* (Cambridge, MA: Harvard University Press, 2004), 208.

92 Andreas K. Engel et al., 'Dynamic Predictions: Oscillations and Synchrony in Top-Down Processing,' *Nature Reviews Neuroscience* 2 (October, 2001): 704.

93 Wolf Singer, 'Binding by Synchrony,' *Scholarpedia* 2 (2007). See also: [http://www.scolarpedia.org/article/binding\\_by\\_synchrony](http://www.scolarpedia.org/article/binding_by_synchrony).



The data reviewed indicate that top-down processing is in many instances, associated with modulation of the temporal structure of both ongoing and stimulus evoked activity. In a wider sense, top-down influences can be defined as intrinsic sources of contextual modulation of neural processing. Obviously, top-down factors include the activity of systems involved in goal definition, action planning, working memory and selective attention.<sup>94</sup>

These top-down influences are the very substrates that neuropower is addressing.

Phaticity, its field of attention-grabbing images and contingent underlying means of production, are no longer 'only' focused on bottom-up processing but on top-down processing as well. Temporal binding operates on these top-down systems, since correlated discharges are much more effective in producing saliency than non-correlated discharges. In fact, repeated synchronization, the binding that results from top-down influences, might have a similar effect on neural distributions as those induced by repeatedly stimulated and synchronized bottom-up stimuli.

A parsimonious explanation would suggest this: they might sculpt neurons according to their repetitive logics. Importantly, these top-down functionally integrated networks synchronize spatially remote cortical areas that are distributed throughout the cortex and subcortical structures. In other words, the frontal lobes do not receive input from the outside world directly but only indirectly through inputs from other parts of the brain that do in fact interact with it directly.

Therefore, they can influence and modulate incoming data from widely diffused bottom-up streams determining, for one, saliency. Saliency is important for memory and future attention and is related to phaticity. Just as we now experience fields of phaticity in which multiple engineered images and iconographies compete for our attention, we also have maps of saliency in which data packaged together by multiple regions of the brain put asterisks on incoming information bundling it for increased recognition or access to the global workspace. With time salient bundles become linked together in working memory. The coupling of phaticity to saliency is of key importance to the administration of power in tertiary attentional economies. As a result of this coupling phaticity has a direct link to salient conceptions in working memory. As a result of multiple synchronizations between the two, the phatic image can have direct access to the future prognosticating capabilities of working memory and can incite it on its own. Phatic fields form their own templates through the power of the emergence of both explicit and implicit cooperative linkages. In contemporary market driven mass consumer society these templates call out to the brain and mind and form the new epistemological templates. When these templates are organized in time according to the logics of mental pathways they become epistemological trajectories. We now

begin to fully understand the importance of parents acting as institutional agents in the early instruction of their children whose forebrains have not yet fully developed. The ability to prognosticate also must be learned. The signs and symptoms imbedded in designed space that are necessary for correct future decisions, the epistemological templates and trajectories just mentioned, must be first paid attention to singularly and then as groups after which they can be memorized on their way to forming cognitive habits. This has implications for the development of the neural circuitry that must in future occasions operate on its own to make decisions when the parents are no longer available. The specter of the state has therefore left an impression upon the gyri and sulci of the brain before the child has had a chance to make decisions on its own.

Neuropower is directed toward these top-down influences and can therefore trump noopolitics. As I have shown above, Neuropower, as an administrative technique, today depends on distributed networks that make up our global informational economy. It is that distributed system of cultural intensive logics that has been coupled to the proclivities of the brain. It is not that extensivity is gone and has been replaced by intensive culture or non-hierarchical processing has won the day. They exist side by side. What I am implying is that as our cultural disposition slipped toward a more intensive one, those apparatuses in the brain best suited for its interpretation were frequently enlisted. Such is the case with the information society of mass intellectuality where abstract knowledge and prognostication of future results has become more and more important. The forebrain, the brain center that forms our goal-directed habits, is contingent on connections it makes with areas all over the brain and therefore requires distributed networks to do its work. Neuropower and the institutional understanding for whom it does its bidding is directing its attention directly to areas of the frontal and prefrontal cortex as well as related and contiguous structures involved in decision making like the cingulate gyrus.<sup>96</sup>

In a post-Fordist view of labor there is recognition of the centrality of (an ever increasing intellectualized) living labor within production. In today's large reconstructed company, a worker's labor increasingly involves, at various levels, an ability to choose among different alternatives, and, thus, he or she has a degree of responsibility regarding decision-making. Neuropower directs its attention at these new conditions of the worker's role and the neurobiological centers that direct attention and choice. It does not act alone. It is assembled upon the *dispositifs* that preceded it: those of the disciplinary society, the society of control and noo-politics.

A new field called consumer neuroscience or neural marketing has adapted the tools of neuro-

94 Engel et al., 'Dynamic Predictions,' 714.

95 Ibid.

96 Michael Platt and Camillo Padoa-Schioppa, 'Neuronal Representations of Value,' in **Neuroeconomics; Decision Making and the Brain**, eds. Paul W. Glimcher, Colin F. Camerer, Ernst Fehr and Russel A. Poldrack (London: Academic Press, 2009), 442. The following passage is particularly relevant: 'In this chapter, we review the current understanding of the neural processes that construct representations of biologically-relevant value, translate these valuation signals into behavioral decisions, and update representations of value upon which future decisions are made. These results are largely derived from studies where the activity of single neurons is recorded in monkeys making choices. Our review will focus in particular on three brain regions—the orbitofrontal cortex (OFC), the lateral intraparietal area (LIP), and the posterior cingulate cortex (CGp). Value representations differ substantially in these brain areas, suggesting that distinct representation of value may contribute to distinct decision processes.'

science to evaluate and determine the response of consumers to product choices.<sup>97</sup> Although in its infancy, research into consumer proclivities and its connection to the goals of neoliberal global capitalism in which the social, political, historical, psychological, and economic conditions that define culture are bound could have a radical effect on the nature of the multiplicity. Individual freedom could be at risk in a world in which powerful new tools like After Effects, 3-D modeling, surround sound and radical editing procedures produce incredibly intense photographic and cinematic visual images and feelings, now joined together with new powerful tools to probe the brain and see its reactions. Additionally, these tools link to what I am referring to as epistemological trajectories in such phenomena as built space. Epistemological trajectories are extended processes that originate in the decision making processes of the brain that find their analogies as immanent concretions of meaning in space and time embedded in the world milieu that call out to the brain and mind to direct its contemplations along congruent pathways. This argument extends the idea of endo-colonization whereby the military-industrial complex inverts its exteriorized desire machine from one in which conquest of other people is substituted for conquest of one's own.<sup>98</sup> Here, beyond the de-realization of the perceptual faculties in which time and space are simulated and duplicated with hypermedia, the cognitive apparatus links such a mutated real to a sculpted neurobiologic architecture by directly affecting neuroplasticity. This is one side of the story of the agency of neuropower. But just as the term biopower expresses both a threat to individuality and a possibility for new forms of resistance, so too does neuropower. "This may explain the common thread running through much of avant-garde practice as being a struggle toward changes in perception; a struggle of the "affective classes" who attempted and attempt, by practices aimed at "deautomating perception," to reformat the "instincts."<sup>99</sup>

It is against this backdrop that art and architecture, cognizant of the conditions of this dynamic circumstance of neuropower, utilizing their own histories, procedures, technologies, and materials, sample other temporalities imbedded in the pluripotential condition of the time environment to produce an alternative experiential dynamic re-distribution of the sensible. I would like to make the claim that in a world in which police action is directed, as Rancière says, at the maintenance of the conditions of the distribution of the sensible, art and architecture in their disruption of this dynamic regime of sensibility create a state of emergency and in some cases a state of exception. How does this happen? As we have seen in the case of John Cage's work, noise music, and art in its most powerful sense decouples or uncouples the spatial and dynamic contingencies utilized by the institutional understanding. First, the potential for new temporal dynamic coupling through the agency of a theory like metastable coordination dynamics allows for changes, instituted for instance in visual culture, to gain tenacity in the internal dynamics of the brain of those who are able to first comprehend and

understand it. Coupling and uncoupling could be seen now as learning different configurations of perchings or changing the time the bird or brain mind sits in a particular mind space before alighting again.

There are subpopulations within the general population who have innate neurobiological dispositions, since the nervous system has a tremendous intra-species variability at birth, that make them more sensitive to certain naturally and culturally produced patterns. Secondly, through the process of destabilizing institutional spatial/temporal continuities, consistent harmonies may be made discordant and discordant sounds may appear melodious to those who are making them. They are singular productions that may constitute a local affect of like-minded participating singularities. As such either might produce new forms of attentive sensibility or fields of sensibility in the case of branding cooperatives to be tethered to existing institutionally provoked oscillatory patterns already operational in the brain. The struggle for artistic and architectural relevance and importance is all the time being subdued by institutional conditions that attempt to mollify the intensity of artistic expression through its incorporation into generalized market forces or pop culture without critique. In other words, institutional networks try to weaken art power and try to normalize it. We have already mentioned noise and improvisational bending of the aural landscape, and we might further say in relation to situationism that psychogeography, *détournement*, and the *dérive*, along with queer, feminist, and postcolonial sensibilities, among others, create different apparatuses and discursive fields whereby general intelligence accesses them.

Cultural capitalism allows for certain individuals to sample alternative distributions of sensibility and produce a common understanding in ways very different than those proscribed by the institutional understanding acting in accordance with the rule of law. This was explained above in terms of the new distressed and modified images found on the Internet, which have become a kind of emblem or icon for a new generation of Internet viewers. This is the essence of what I would like to refer to as the 'theory of epochal sculpting.' There are generational differences that, as a result of the conflicting and dissonant paradigms that exist between the one taught to them by their parents, which reflects the past cultural milieu, and the one generated by the contemporary cultural sphere with its implicit cultural trajectories resulting from new technologies, forms of music, neo-avant-garde visual displays, poetic voices, forms of social networking and psychological dispositions and so forth, provoke changing distributions of the sensible and insensible. (The insensible acts as an invisible force giving structure to the sensible.) Different distributions have different kinds of hubs and points of distribution. Extensive grid-like distributions call out to the body-mind and interact with the neural plasticity in a very different way than intensive topologic distributions. The object, real thingness, and the abstract real operate very differently in these two conditions. Why is this important? These very different spatial and temporal logics produce very different subpopulations of subjects. For instance, those that feel comfortable surfing

97 Carl Senior and Nick Lee, 'Editorial: A Manifesto for Neuromarketing Science,' *Journal of Consumer Behavior* 4-5 (July 2008): 263-71.

98 Paul Virilio, *Pure War*, translated by Mark Polizzotti (New York: Semiotext(e), 1998).

99 Howard Slater, 'Prisoners of the Earth Come Out: Notes Towards War at the Membrane', in 'Noise and Capitalism,' eds., Mattin Illes and Anthony Illes (Donosita: Arteleku Audiolab *Kritika* series, 2009).

the web and being tattooed and those that do not. These differences are generational. The signs and symbols of one subpopulation can be very different to that of the other, and as we have seen over and over again in this text, this can have implications for both neuro-modulation and neuro-mutation, such that the cognitive dispositions of one generation could be very different than the other. What is perceptible and understood by one group is considered sublime by another. Consider here how difficult it was for an older generation to develop the habits and skill to feel comfortable with computer technology. Fredric Jameson's work on postmodernism illuminates this in terms of contemporary architecture. He contends that the perception of a postmodern space or object will have to await the production of a new generation of perceivers who have learned the new habits of perception necessary to its understanding. For those whose perceptual habits were learned in a modernist environment such an understanding is impossible.<sup>100</sup>

What are the political ramifications of this? If we are to believe Rancière, the role of government today is not so much to police the laws of a people, but instead to police and maintain the distribution of sensibility. Once maintained and stabilized, governing will fall into place. Neuropower extends this argument to include the regulation of the insensible abstract logics of a perception in motion occurring in the decision making processes in the brain that the new apparatuses of neoliberal cognitive capitalism like neuro-marketing can adjudicate. The police's role is to monitor changes in that distribution, and by preserving it, thereby sustain the status quo of the population. What then of the effects of a mutation of the built space carried out by conceptual artists of a new generation? Will a police system raised and neurobiologically cultivated by modernist spaces have the cognitive tools to monitor and survey a postmodern generated distribution of spaces and times? Or more recently, how would a police system whose cognitive applications have been configured by the post-modern logics of the past 50 years address a recently made modernist object that for all practical purposes appears like those made in the 1930s, but whose meaning for a select group of cultural savvy is a response to the digital age? How can they police that object which on the surface appears like something they know, but which reflects a whole set of contingencies bound up in its abstract real which makes it signify something complete different even radical? Might then this redistribution or some other occurring at some other time, in fact, be sublime to those in power to police, being as it is beyond the perceptual and cognitive capacity of the surveyor as a form of the 'neurobiological sublime'?

New forms of art, new spaces, and new temporalities may exist beyond the police's ability to perceive and cognate them. It therefore goes unnoticed by those regulating the spatial and temporal order. They may not see it as a threat or may not perceive or understand it at all. As such, it may continue to fester, transform, and metamorphose the conditions of the visual, auditory, and cultural order without notice. Thus providing a temporal window for resistance in which these

changes remain under the radar of the policing agency and thus might have the implicit power to sculpt a very different subject. When extreme aesthetic drift occurs, paradigm shifts also occur. This process comes to a point, when in fact the governing bodies do recognize a change and send out an alarm that reverberates throughout the institutional networks. But it's too late and the population is now different. It has been transformed by an alternative system of individuation. A different form of the pre-individual has been sampled creating a non-passive subject. These contemporary populations have the potential to create even greater changes in the distribution of the sensible and a state of emergency ensues in the distribution. Aesthetically blind police can no longer be depended on to maintain order. As George Schwab states in his forward to Carl Schmidt's *Political Theology*, 'In short, "the exception" said Schmidt, "is that which can not be subsumed."<sup>101</sup> A state of suspension of government ensues, and a state of exception is produced. In this hypothetical narrative, the power of art can produce what he calls a state of exception. Importantly:

The exception can be more important to it than the rule, not because of a romantic irony for the paradox, but because the seriousness of an insight goes deeper than the clear generalizations inferred from what was ordinarily repeats itself. The exception is more interesting than the rule. It confirms not only the rule but also its existence, which derives only from the exception. In the exception the power of real life breaks through the crust of a mechanism that has become torpid by repetition.<sup>102</sup>

100 Fredric Jameson, *Postmodernism, or The Cultural Logic of Late Capitalism*, (Durham: Duke University Press, 1991), 38.

101 Carl Schmidt, *Political Theology: Four Chapters on the Concept of Sovereignty* [1922], translated by George D. Schwab (Chicago: University of Chicago Press, 2005), xlili.

102 *Ibid.*, 15.