SHIFTER 16

PLURIPOTENTIAL

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Sculpting the Brain, and I don't mean like Rodin
An excerpt from Neuropower

Part 1.

"…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." [1]

"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." [2]

Today more then 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 is altered 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

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

2 Edwin Hutchins, Distributed Cognition, IEBS Distributed Cognition, page 5

after brain injuries. For instance, a child is able to recover 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 be in response to changes in the external milieu. During the unfolding of the genetically determined neurobiological time table there are critical periods of development in which certain regions and systems of the neurobiological substrate are extremely sensitive to various conditions including the linguistic-cultural milieu, which predispose it to language acquisition during a particular window of time. But the bigger question then becomes what language. The child's brain has the potential to learn any of the thousands of languages in the world. Which one is learned is dependent upon the close coupling of the childs brain-mind to his or her linguistic field.[3] As we will see in what follows, it is this condition of neural plasticity that 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 – which, through the policing of that field defines 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 micro-cultural context of the work place and understand it as a form of restricted distribution of sensibility, as a controlled space to perceive in action, we begin understand its historical effect on neuromodulation.[4]

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.[5] When the conditions of the information economy predominate, as they do in Northern European countries and the United States, and the emergent forms of general intelligence that result are expressed as conditions of networked and distributed systems defined as intensive, the possibility for intensive neural sculpting is great. Let us look deeper into the reasons why.

Two conditions have implications for how we might understand the idea of general intelligence. In the *Fragments on Machines*, Marx understands the

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

4 Alva Noe, *Action in Perception*, Bradford Book, MIT Press, 2004, page,1.
"I argue that all perception is touch-touch like in this way: Perceptual experience acquires content thanks to our possession of bodily skills. What we perceive is determined by what we do…"

5 A.R. Luria, *Cognitive Development: Its Cultural and Social Foundations*, Harvard University Press, 1976
"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."

idea of general intelligence as 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 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 conscious 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."[6] Their labor is fetishized into a series of partial acts that together produce the object and the machine is what binds all their minds together ###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, 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 and the architecture that reflects it breaks up and is dispersed horizontally, distributed across multiple times and spaces and the products that emerge 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, and the information they produce reflect the conditions of this production. Hence, the collectivity of the human intellect is ultimately also evident in the machine. Machines "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."[7] As we will see in the age of information

6 http://www.marxists.org/archive/marx/works/1857/grundisse/ch13.htm-page 692) quoted in Gerald Raunig, A Few Fragments on Machines, http://transform.eipcp.net/transversal/1106/raunig/en)

7 Ibid., Raunig, 2005, page 3

and mass intellectuality, it is,in fact information itself that sculpts neural plasticity. General intelligence here is defined as information *produced by those mutating conditions of labor accessible to any population*, which are also the new conditions of neuromodulation. These conditions of distributed information are powerful attractors that can act as powerful regulators of attention and memory and thus are sites of what Maurizio Lazzarato calls Noo-power.[8] This Noo-power 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, through assemblages of trajectories of attention, subsumed in the regulatory patterns of built space, with its implicit temporality and representational and presentational rationality that the sculpting of neural plasticity can occur. Whereas Noo-power concerns people in the present, Neuropower concerns the production of people in the future.

In the conditions of intensive culture the representation of an object as something real is substituted by its branded value where what determines its nature are the stories that orbit around it and the complex conditions of its brand equity. The cereal in a box of cereal is not what creates its value but rather the way that the information on the box design excites a concomitant "considered" neural architecture sculpted over time by a complex assemblage of a previously designed context that the individual has experienced and into which the box is inserted. The cereal box is reinstalled ad infinitum into a system of recategorical memory that creates an active site for its infinite retrieval in the minds eye as 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 non-linear 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 apparatuses of Cognitive Capital and Cultural Capital. Different cultural contexts allow different expressions of each, which then have implications for the production of a people or a multiplicity. Cognitive Capital being defined as that "information distribution and production system" centered on 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 is used 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 which, when assembled in the cultural landscape, mutate the conditions of that landscape and produce resistant paradigms. It is at the intersection of these mutating conditions expressed as a resultant cultural referendum, that the brain and mind are called

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

out to by different attentional concoctions activating different attentional neurologic toolboxes. Thus the relationship between Cognitive Capitalism and Cultural Capitalism has implications for how the brain itself will be formed and I would like to suggest its possibilities for thought. It is at the crossroads of competition and cooperation - between these two systems of abstract knowledge production - that the brain-mind is produced.

Part 2.

> *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…*
>
> —Tobin Harshaw, *Can 'No' Revive the Republicans*, nytimes.com, 3/26/2010

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 Neo-liberal 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 use ideas from The Theory of Neuronal Group Selection as formulated by Gerald Edelman as well as Neural Constructivism, formulated by Steven R. Quartz a1 and Terrence J. Sejnowski.[9] [10] [11] The basic question that these two theories ask is what are the determinants of 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-

9 Gerald Edelman, *The Remembered Present*, (New York: Basic Books Inc., 1989)10. Jean-Pierre Changeux and Stanilslas Dehaene, "Neuronal Models of Cognitive Functions," in Mark H. Johnson, ed., Brain Development and Cognition, (New York: Blackwell, 1993) pages 363-403

10 Jean-Pierre Changeux and Stanilslas Dehaene, "Neuronal Models of Cognitive Functions," in Mark H. Johnson, ed., *Brain Development and Cognition*, (New York: Blackwell, 1993) pages 363-403

11 Steven R. Quartz and Terrence J. Sejnowski, "The Neural Basis of Cognitive Development: A Constructivist Manifesto," *Brain Sciences* 20(4) , 1997, page 6

cognitive machine? This theory has the benefit of parsimony and mimics in certain ways the concrete genetic and immunological systems already in place. Alternately, according to Neural Constructivism, 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."[12] 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."[13] My argument is that each theory provides a theoretical foundation for us to understand 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 inter-connected, functionally more specialized and sometimes progressively complex through the brain's relationship with the stimulating conditions of complex representational matrices. In this way Neural Constructivism is more Bergsonian.[14] [15] [16]

For our purposes here, both theories and perhaps the two together operate well as a heuristic model, as well as being compatible with a post-structural theoretical model I would like to elucidate. Cultural conditions are continuously evolving and producing 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 with which they become coupled. These assemblages or props are historically derived and are embedded in the distributions of sensibility as cognitive gestalts hybridized to

12 *Ibid*. Quartz and All, 1997, page 6

13 *Ibid*. Quartz and All, 1997, page 6

14 *Creative Evolution*, Henri Bergson, Dover, 1998, page 102.
"Just so as regards the evolution of life and the circumstances through which it passes-with this difference, that evolution does not mark out a solitary route, that it takes directions without aiming at ends and that it remains inventive even in its adaptations."

15 *Ibid*, Bergson, Dover, page 104.
"Evolution is not only a movement forward; in many cases we observe a marking-time, and still more often a deviation or turning back. It must be so, as we shall show further on, and the same causes that divide the evolution movement often cause life to be diverted from itself, hypnotized by the form it has just brought forth. Thence results an increasing diorder. 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."

16 *The Embodied Mind: Cognitive Science and Human Experience*, Francisco J. Varelan, Evan T. Thompson, MIT Press, 1991

planned trajectories of thought. Along with the sculpted internal cognitive loops to which they are coupled, the cultural external circuits complete the organic-inorganic assembled network. These are the building blocks of a complex field of such loops. When these loops are tethered together, a hundred or thousand fold, as a result of their proximity and overlap they form assemblages and their dynamic and emergent intensive conditions begin to be realized.

It matters little whether one takes Neural Darwinism or Neural Constructivism as the model in the argument laid out here. For both in the end rely on the conditions of epigenesis, and in this case cultural epigenesis, to produce or sculpt the neurobiological substrate into 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-solvng 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 non-biological props and structures: the idea that, under certain conditions, such props and structures might count as proper parts of extended cognitive processes"[17]

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. What happens after that is an answer that Neural Constructivism attempts to answer.[18]

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 Re-

17 Andy Clark, *Supersizing the Mind*, Oxford, 2008. Pg. 68

18 *Ibid*, Quartz and Sejnowski, 1997, pg. 36
"The evidence we have examined demonstrates that the popular view of development as largely a regressive event must be reconsidered. We suggest that regressive events are simply the consequence of reduced neural specificity, as indicated by the counterevidence to Sperry's chemoaffinity hypothesis. Any theory, whether selectionist or constructivist, that rejects a strong view of neural specificity will thus need to posit regressive events. If cells do not bear nearly unique molecular addresses, then stochastic sampling mechanisms must be posited. These will by their very nature introduce some structure into a system that will later be eliminated. Neural constructivism allows these sampling mechanisms to be directed, but they are still stochastic. Structural elimination, or error-correction, are likewise required, but this does not mean that error-correcting processes are the only developmental mechanisms, or that developmental selection occurs only among intrinsically generated structures. Rather, selection is only one kind of process in a dynamic interaction between environmentally derived activity and the neural growth mechanisms that activity regulates.)

entry, which stabilizes and elaborates upon the Secondary Repertoire. I will cover Developmental and Experiential Selection now, leaving Re-entry 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 the Neurobiologic Common from which the brain/mind emerges through its engagement with culture.

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 awaits the moment of its unfolding not as a nativist series of heterochronous events emblazoned in the codon of the genome but rather an unfolding or becoming in the context of a duet between itself as the inherent structural conditions and apparatic conditions of brain in the context of nature or as I am arguing today, 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.

"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."[19] 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 history of the neurobiological adaptations.

I would like to contend that Neuropower is in fact directed towards this neural biodiversity, attempting to limit its potential. In other words, just as global biodiversity is currently under siege by various factors affecting the conditions of global capitalism including, pollution, over-fishing and the encroachment of habitat, effecting as it does the diversity of flora and fauna, so too do other conditions of this same world system, those that strangle difference to

19 R.J. Scholes et al., "Toward a Global Biodiversity Observing System," *Science*, Volume 321, page 1044

produce a homogenization of the cultural field and limit epigenetic neural biodiversity. For instance it is feared that in a century, half of the six thousand seven hundred languages that are now active on our earth will be lost. Furthermore design culture affects not only the early depletions and pruning of neural arborizations like a topiarist who clips the branches of thick bushes to produce fantastic shapes, but also choreographs and guides the regrowth of the branches along prescribed pathways to produce specific forms. Neural Darwinism would be the topiarist but Neural Constructivism, the choreographer. Further on I will show how the homogenization of the cultural field by the international style or franchise architecture both conditions the global economy and restricts variation. As a result it produces a crisis of neural network diversification leading to a crisis of the imagination. Neuropower, therefore, is not simply about past evolutionary history but rather, of its history in the future.

The Secondary Repertoire is a result of epigenesis and neural plasticity during a process called Experiential Selection. The word repertoire is very often related 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 as well. 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.[20] One could say that this term could also be used in a Neural Constructivist account. However instead of being the result of a regression and deletion of neural elements the secondary repertoire in this account is the product 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.[21] In the Secondary Repertoire that electrical activity is joined

20 Paolo Virno, *The Grammar of the Multitude*, page 70. In this idea of Neuropower the virtuoso performance does leave a materialist residue. Rather then a formed product it leaves memory traces which have the potential to mutate the conditions of the neurobiologic architecture.

21 http://en.wikipedia.org/wiki/Hebbian_theory

Hebbian theory concerns how neurons might connect themselves to become engrams. Hebb's theories on the form and function of cell assemblies can be understood from the following: "The general idea is an old one, that any two cells or systems of cells that are repeatedly active at the same time will tend to become 'associated', so that activity in one facilitates activity in the other."

"When one cell repeatedly assists in firing another, the axon of the first cell develops synaptic knobs (or enlarges them if they already exist) in contact with the soma of the second cell." Gordon Allport posits additional ideas regarding cell assembly theory and its role in

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 (RIVI).[22] 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 where as 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.

The development of ocular dominance columns of layer IV of the primary visual cortex is a case in point. Ocular dominance columns are anatomical structures that appear like columns in microscopic examination found in the visual cortex and are anatomically defined regions of input from one eye or the other. They contain a number of different cell types that utilize different strategies for the processing of visual information like simple, complex and hypercomplex cells, which all share a common visual field. 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."[23] This theory promotes neural development as a system, which 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

forming engrams, along the lines of the concept of auto-association, described as follows: "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."

22 Wolf Singer, "Coherence as an Organizing Principle of Cortical Functions," in Olaf Sporns and Giulio Tononi, eds., *Selectionism and the Brain*, (San Diego: Academic Press,1994) page 158."The probability that neurons synchronize their responses both within a particular area and across areas should reflect some of the Gestalt criteria used for perceptual grouping… Individual cells must be able to change rapidly the partners with which they synchronize their responses if stimulus configurations change and require new associations…If more then one object is present in a scene, several distinct assemblies should form. 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."

23 *Ibid*, Quartz and Sejnoazki, 1997, page 17

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…. and that this growth is a progressive increase in the representational properties of the cortex."[24]

Again the mechanism is important to consider in order to understand the brain's development, but for our purposes an immature neurobiological substrate in both cases is transformed into a more finely tuned environmentally and contextually driven machine. What then is the effect of living in a networked society with the internet, cell phones, face book 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 Metroploitan Opera House and The Island City Central Park Gringrin, and Zaha Hadid's Hungerburg Funicular are cases in point. What then is the effect of these new spatial and temporal contingencies on 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 and this learning changes the conditions of the brain itself. Learning a language changes the conditions of interacting with the world and what becomes relevant changes. What we pay attention to is key to what we learn and what neural networks will be activated and amplified.

Experiential Selection does not, like natural selection in evolution, occur as a result of differential reproduction, but rather 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.

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 advert, not surprisingly, was effectively designed for maximum and rapid perception by both a pedestrian and auto driven public. (Traffic jams slow automobile traffic to a crawl.) The color and

24 *Ibid*, Quartz and Sejnoazki, 1997, abstract

design of the advert interestingly used strategies first found in the pop paintings of Andy Warhol, Roy Lichtenstein and Robert Indiana. The advert was designed with a specific context in mind in which other products advertised and within the same visual milieu reverberated together producing a network of stimulation. In other words the advert itself and its relation to other similarly designed adverts in combination produced an intense effect upon the viewer. It is these individual forms and their combined effect in the network in which they are embedded that produces correlational learning resulting in temporal coincidence at pre and post-synaptic membranes in local and global cortical mappings that strengthen synapses in the brain. But this advert also occurred on multiple platforms distributed repeatedly on television screens, computer laptops throughout the planet simultaneously. In other words we, as members of the planet earth are stimulated by the same franchised sensations that know no national boundaries. 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 intense stimuli and are therefore more apt to be favored over other neurons and neuronal networks in future encounters with those stimuli. 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. Cultural mappings are intensive, delineated by a multiplicity of immanent social, historical, psychological, economic and psychic relations that are collaged together forming a superstructure though which they can produce understanding. 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 or driving or surfing the web.

There is an ecological logic to the forms of immanent distributions that are produced.[25] Branded environments are one such example where through corporate agreements Nike Shoes, Post Grape Nuts, Hertz Rent Car, Airberlin, and Sony Music appear together in the commercial landscape of billboards and airline magazines. The Institutional Understanding and sovereignty for which it does its bidding is empowered by this network of cultural signifiers. 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.

25 Giulio Tononi, "Reentry and Cortical Integration," in Olaf Sporns and Giulo Tononi, eds., *Selectionsim in the Brain*, (San Diego: Academic Press 1994) page 129.
"Two of the main tenets of this theory are that neurons act together in local collectives called neuronal groups and that they communicate with each other and correlate their activity by a process called reentry."

Part 3.

Each brand is made up of its brand equity and its externalities that together compete with other assemblages for the attention of the market place.[26] Brand equity is explicit; it is a real entity that can be quantified based on market studies, while externalities are implicit and in the process of becoming. They are ineffable and incalculable.

Externalities can under certain conditions become explicit. Vans shoes were originally just tennis shoes to be worn all day. Their appropriation by skate boarders and their resultant popularity could never have been imagined. It was a result of a burgeoning skate culture in Southern California that added to its explicit brand equity when later they were understood and advertised as skating shoes.

They are overlaid or superimposed or embedded in already existing networks of cultural signifiers and as such inflect upon diagrams of attentional flow. They form selective pressures, which are coupled to analogous selective pressures in the brain/mind. The conditions of cultural intensivity integrate dynamic flows of hierarchical distributions together with folded rhizomatic distributions of sensibility that these branded environments are instrumental in producing.

Already existing oscillatory potentials, important for the production of the dynamic environment of the brain, transmitting information throughout it, are piggy backed by dynamic gestalts and rhythms at play in the cultural environment and onto which branded equities are imbricated. It is these dynamic potentialities as they are phase locked in ensembles synchronously and diachronously that create intense branded networks. These stimulate 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 architecture of the brain/mind. In the competition for neural space during critical periods of development, neural networks selected for by these branded environments will out-compete those that are not selected for, which either wither away or are incorporated in other assemblages where they can continue to play a role and be stimulated.

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 with the child's mind in mind are transmitted cross-culturally during Saturday morning cartoons. These specially designed advertisements are analogous to

26 I was first introduced to the idea of externalities and their relationship to Cognitive Capitalism in a lecture by Yann Moulier Boutang given at the conference I helped organize with Deborah Hauptmann called "The Mind in Architecture" at TU Delft School of Architecture in 2008. A related text will be published in *Cognitive Architecture: From Biopolitics to Noo-power*, 010 Press, 2010.

"babyese," in which parents prolong and exaggerate certain key phonetic distinctions coupled to the child's immature brain. The same is true of childhood advertisement. Bright colors, fantastic talking cartoon animals, speaking in "babyese," 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 himself/herself from others. This is where the Society of Control really begins in the inside/outside of the child's mind.

But there is another way that the conditions of capitalism are transmitted to the child and that is indirectly, through the parents. As I mentioned in the introduction, Neuropower is focused 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 indispensible in the early process of learning and language formation. Later, when these activities involve planned action, for instance, parents extend their children's abilities by acting as and being agents of their frontal lobe.[27] They are there to help them plan beyond the here-and-now. This coupling of adult and child is a necessary condition of the early neural sculpting of Neuropower. The parent is at the service of institutional understanding, acting as its agent of neuromodulation. But perhaps in the future with more sophisticated computer interfaces and software agents, the parent won t even be necessary as the following quote from Andy Clarks Mindware suggests. "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 co-evolutionary 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 a 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 sub-personal cognitive functions active in your brain."[28]

27 Bruce Wexler, *Brain and Culture*, page 108-9.
"Given the prolonged postnatal physical maturation of these structures in human beings, lasting until or beyond puberty, it is not surprising that adults must provide these functions if they are to be present in the behavior of infants and children. Essentially, then, the frontal lobes of parents are functionally linked with the lower brain centers and the sensory, motor and association cortices of their infants and children. While the child's frontal lobes are developing, the parents' brains provide frontal lobe functions for the child."

28 Andy Clark, *Mindware*, Oxford, 2001, pg. 115