

Blow-up: Photography, Cinema and the Brain

BY: WARREN NEIDICH

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“I am proposing the notion that we are here in the presence of something like a mutation in built space itself. My implication is that we ourselves, the human subjects who happen into this new space, have not kept pace with that evolution: there has been a mutation in the object unaccompanied as yet by any equivalent mutation in the subject. We do not yet possess the perceptual equipment to match this new hyperspace, as I will call it, in part because our perceptual habits were formed in that older kind of space I have called the space of high modernism.....The newer architecture therefore-like other cultural products I have evoked in the proceeding remarks-stands as something like an imperative to grow new organs, to expand our sensorium”.

Fredric Jameson, Postmodernism or, The Cultural Logic of Late Capitalism, page 38.
(1)

“In postwar film he (Deleuze) sees a “lived brain,” which works by “irrational” connections, prior to mental states.....beyond the “objectivized” brain, art as well as philosophy might create multiple new paths or synapses, not already given-new connections.” John Rajchman, The Deleuze Connections, page 11. (2)

INTRODUCTION: “Blow up: Photography, Cinema and the Brain” is the story of the construction of the late twentieth century observer. First of all it describes the multiple and connected genealogies of an ever more refined subjective and projective optical apparatus beginning with the camera obscura and evolving into its’ most recent manifestation the virtual reality and computer games. This history defines an increasingly accurate optical image that can be mechanically visualized, reproduced and distributed. As we will see in more detail later each culture as it exists in its’ own time and place is defined by a hegemony of interrelating and networking immaterial relations such as sociologic connectedness, unconscious psychological reasons, economic forces and political intrigues that bind it’s members together act to define it. By accurate I mean optical systems that make visual those unseen immaterial relations giving them an optical form that can be analyzed and appreciated by the

culture that invented them. The phrase genealogical structures, refers to the separate and intertwined evolutions of these subjective optical instruments between themselves, as one technological milestone creates a foundation for the next, and the parallel set of inventions that act investigate the body itself, like the X-RAY, CAT SCAN and MRI, which through their probing unveil the natural conditions of the body necessary for perception and cognition in the first place. Later on we will add one more element to this equation. The brain and the its' neural-synaptic structure which we will see are active and passive participants in this process. Culture is in a constant state of transformation as it responds to a constantly mutating milieu determined by the above mentioned relations in a constant state of flux. The transformation of culture induces pressures to produce new kinds of technologies to make it operate more smoothly and coherently. Each of these technologies whether it is the steam engine or the computer are on one hand the product of an evolving social, historical, political, psychological milieu and on the other generate new forces which require the invention of new tools to push it further along forward. One direct outgrowth of the creation of these newly invented culturally derived devices are the optical technologies. Many new devices are invented that allow culture to visualize itself but only a few are really relevant and these, as a result of their widespread use and dissemination, help define and optically describe that culture. Such is the case of photography and cinema. But their effect is not limited to simply its lineage as a device in a history of such devices. These optical inventions feedback on culture itself changing its' face in the context of this new view of itself as well as feed-backing on the brain through their effect on networked relations in the real world and the brain's response to them. It is this latter concern that forms the heart of this discussion. I will show how these new technologies and there effects are imbedded in culture at large and how through a process called Neuronal Group Selection they act to change the way the neural networks of the brain may be organized and reconfigured. I hope to show how photography, cinema and most recently virtual reality have redefined the cultural context from one defined by stasis into one defined by dynamism: a dynamic state in which space and time relations are redefined. It is this dynamic image, which adapts itself ever more adequately to the neuro-anatomic and neuro-physiologic specificities of brain function, such as oscillatory potentials on the one hand and reentry on the other. These terms will be defined in greater detail later. What is essential to appreciate here is that early cinema and later avant-garde cinema created a new temporal dimension which through culture could be disseminated. Its power to communicate was not only found in its projective qualities that allowed hundreds if not thousands of people to appreciate it together but was found in the ease with which those individuals could perceive and cognate it. (3) Culture provided a device or apparatus by which this newly reconfigured temporality could be imbedded and artists were its emissaries. As the twentieth century emerged out of the nineteenth century more and more artists became aware of this new temporality and began to imbed its original awkwardness into their work. In literature there was Proust and Mallarme. Proust brought new meaning to reconfiguring the past and Mallarme reconstructed the devices of the poetic voice to give richness to the meter of the internal voice. In painting there was Marcel Duchamp with "Nude Descending a Staircase #2" and "Sad Young Man on a Train, 1911" in which the temporality discovered in the pre-cinematic photographs of Muybridge and Etienne Jules Marey were visible in painting. Others followed such as Frantisek Kupka with his "Organization of Graphic Motifs, 1912-1913" and Giacomo Balla with his "Girl Running on a Balcony 1912" In architecture Le Corbusier reinvents the "porte-fenetre" into the "fenetre en longuer". Beatriz Colomina writes "This rethinking of culture through a systematic reappropriation of photography transforms the fundamental sense of space in Le Corbusier's work. The transformation is most evident in his thinking of the window. After all, the window like the photograph is first of all a frame. The frame

of Le Corbusier's window, like his photographs of the Parthenon, upsets the classical viewer's expectations, precisely because it cuts something out of the view. (4) Later she alludes directly to the filmmaker Dziga Vertov in her description of the experience of seeing through these windows. "to an unfixed, never reified image, to a sequence (of photographic images) without direction, moving backward and forward according to the mechanism or the movement of the figure". The viewer is moving in a cinematic space. As a result of the reinvention of space/time coordinates as they became manifest in this new art, language and architecture, just to name a few, the world in which the spectator or observer moved and lived became changed. The implications of this will be one of the subtext of this essay. It is my opinion that it is this fundamental change in built space that has specific implications for the developing brain. In fact as these new time based relations become configured in the physical world they become remapped into the way neural networks are configured, their spatial relations, and how they operate and communicate to each other through these temporal relations. Whether these temporal and spatial qualities exist as a strategy of the brain already and are simply stamped on the physical world or whether the brain we are born with has infinite potentialities which are unmasked or invented as a result of the new possibilities opened up to it by the changing world that it confronts is one question I hope to address as well.

Whatever the case the cinematic/virtual image, is an image that by its very nature calls to brain in a more direct way. (5) Its structure and its reflectance, I am limiting this discussion to visual images although this argument is pertinent for acoustic, gustatory, kinesthetic, and somesthetic perceptions as well, attract attention in superior ways than images emerging from for instance, nature, because they have been engineered with the human nervous system in mind. I will refer to these images later as phatic after Paul Virilio and the process of their formation as visual ergonomics keeping in mind that they belong to a larger process that I refer to as cognitive ergonomics. "The phatic image-a targeted image that forces you to look and holds your attention-is not only a pure product of photographic and cinematic focusing. More importantly it is the result of an ever-brighter illumination, of the intensity of its definition, singling out only specific areas, the context mostly disappearing into a blur." (6) As such these artificially contrived images compete more effectively for neural space than their natural or organic counterparts and as such build sets of neural relationships or neural networks that are in a sense artificial. The story of "Blow up" is the story of how these artificial neural networks play a role in the construction of what is real for Thomas, the main character of the film, and how they cause conflicts with those formed through more organic relations. I will use the metaphor of memory to build my analysis and suggest that Thomas has two competing memory systems one gleaned through his normal natural encounters with, for instance, his eyes and ears and another sifted through his photographic prosthesis. In the end it is the informational conflicts that arise through the superimposition of these two systems that cause the conflicts of person that in the end lead to his schizo-affective break down at the end of the film.

This essay is structured in a very different way than most. I have decided to use the structure of avant-garde cinema itself with its weaving and back and forth movements, its switchbacks, and its concretions of action and inaction as a way of presenting this material. The reading of this essay is more like a spiral with the reader consistently returning to previous nodes of inquiry. However not only does this format a kind of memory but in each reactivation and recategorization of the site the reader understands somewhat better and in more detail the subject matter. In a recent film "Momento" the director uses the device of editing the film to illustrate the main characters loss of short-term memory. Through the "foregrounding" of this technique the audience

experiences the frustration and disorder of this disability as if it was their own. I use a similar methodology to explore the non-narrative structure as a better means with which to involve the reader as an active participant in constructing a theory with which to understand the brain.

Intoxicated Sight

When Thomas, the photographer fashioned after David Bailey in Michelangelo Antonioni's "Blow Up" (1966), follows Vanessa Redgrave's gaze into the bushes to discover her accomplice in murder, it marks a rupture between concurrent and mutually exclusive discourses. On the one hand, the apparatus of the eye-brain axis, constructed upon the premise of sensation and reaction. On the other hand, the camera as machine is a mechanical apparatus constructed to extend the range of the body but is not itself "of" the body.

Thomas's sojourn in the park is originally motivated by sheer pleasure. His first inclination is to point his lens at nature in full bloom. His distraction by the tryst of the older man and younger woman comes as the result of an obsessed gaze that hunts out and is called by its own nature, voyeurism. As machine, the apparatus of the camera is constructed as a keyhole that frames the world as a window through which a distanced observer may relish in the secret scene of the bedroom, or in this case, two apparently intoxicated lovers involved in a "secret" liaison. The camera makes the photographer invisible; he is but its organic extension hiding behind it. The performance of photographing, this linking of an organic humanity to the apparatus/machine is not without cost: it results in the momentary loss of self. Thomas is unaware of what is actually going on around him. "Jacques-Henri Lartigue, who called his camera his memory's eye, abandoned focusing altogether, knowing without looking what his Leica would see, even when holding it at arm's length, the camera becoming a substitute for both eye and body movements at once." (7)

He is intoxicated by the process of freeze-framing the world. (8) It is later, back in his studio as he hangs his pictures to dry, that he discovers what "really" happened. Only after a series of "blow ups," in which the apparatus of the camera, its' partner the enlarger and photochemical laboratory, are used do the secrets which lay hidden in the pictorial space emerge. One is reminded of Walter Benjamin's comments in "A Short History of Photography". "Photography reveals in this material the physiognomic aspects of visual worlds which dwell in the smallest things, meaningful yet covert enough to find a hiding place in waking dreams, but which, enlarged and capable of formulation, make the difference between technology and magic visible as a thoroughly historical variable." (9) These secret relations exist in and between the parts of an image. They not only define its spatial coordinates, foreground and back round, in-focus and out of focus but its temporal relations as well. Walter Benjamin called these temporal relations, as they existed in photographs and cinema, now-time and "caesura" and their elision and dislocations as space-crossed- time, in which time becomes space and space becomes time. These implicit relations, a term we will return to later in discussing certain processes of the brain, help define the way the photograph is read and therefore understood and they must be uncovered from the image's unconscious and teased away from some of its own ancillary, distorting conditions. Conditions that are the result of a genealogy of relations imposed from the cultural context that over time may actually act to distort its meanings.

Taxonomy of Phyletic and Episodic Memory

Each photograph functions simultaneously in a multiplicity of memory systems that are permeable to each other and effect specific meanings depending on a system of valences and weights. First it is connected to the collective history of images of which it is part and which we will refer to as phyletic photographic memory, for instance the history of photography. Phyletic photographic memory is further divided into a number of genealogical systems based on semantic and stylistic relations. Some examples are the history of journalistic or fashion photography, the photographs contained in the Library of Congress and those that have been collected in artistic institutions such as the Museum of Modern Art. The advent of cinema and its progeny the “movie still” has recently contributed an intriguing component of phyletic memory. Recent photographic practice, such as the works of Cindy Sherman, Gregory Crewdson, and Jeff Wall with its appetite for staging and remixing has made borrowing the sets and stages of film history into a genre all its own. These images and the photographs that have derived from them are well know to the photographic community and form a type long term memory network system which the aspiring photographer must address consciously and unconsciously during the act of photographing. How many of us know young aspiring photographers whose early work describes a process of historic stylistic mimesis in which different styles of great photographers are at first appropriated before the germination of an individual style can take place. The second broad category of photographic memory is called “episodic photographic memory” and it relates to the personal history of the producers own photographic production. For each photographer creates his/her own archive which acts as a kind of parallel memory to the one formed in his or her normal development of relations with the real world. In recent years the work of photographers such as Nan Goldin, drawing on the style of “cinema verite”, have collapsed the idea of episodic photographic memory into phyletic photographic memory by making there most personal experience the subject of their work. Phyletic memory and episodic memory are terms also used in cognitive neuroscience. The former is defined by those genetically engineered spatial and temporal neuronal relations we are as a species are born with and the latter term is defined by how the effects of experience modify these primary” relations. We will see how this parallel photographically derived episodic memory competes with Thomas’s memory as it has been formed through his body’s interaction with the real world and in the end displaces it. Later in the essay when I introduce the terms visual and cognitive ergonomics, we will begin to understand the process by which this displacement by engineered mediated memories takes place. For now let us simply say that they are sexier or as Jonathan Crary says, “obscene” and attract our attention more. (10) It is this attraction that ultimately leads, I will argue, to a system of neural relations, both spatial and temporal, called neural networks that are configured by artificial stimuli. I call these networks by the acronym APSN that stands for “articulated phatic simulated neural” networks. As media and cyber culture determine more and more of the world with which we have contact, as we spend more and more of our time interacting with man made artifice such as billboards, television, computer screens and computer games more and more of our neural connections and the memories that they help code will be organized around these artificial relations.

Returning to the photographer, he or she constructs his/her own system of symbolic relations and meanings that “contextualizes” each new image. For episodic photographic memory embraces both synchronic and diachronic, syntagmatic and paradigmatic relations. In other words each image relates to the image that just preceded it as well as those images made years before. Each image has meaning in the narrative that the photographer is constructing for himself or herself as well as being related to a history of photographic cultural production. For in the end photography

is the act of constructing subjectivity for him/herself and for the members of culture at large. The world hails the artist and the artist finds himself/herself in the anatomy of the world. The photographer and cinematographer create and have a conversation with the world and the product of that discussion is the artwork the totality of which is known as a body of work. The episodic archive of photographs and film are the physical instantiation of what makes the artist. Hidden in the interstitial structure of those images are unconscious and implicit relations. The artist looks into that same space and looks beyond the clichés and instead sews together “discursive regularities” bound together by the synthesis of his or her peculiar self. It is these regularities that the artist can see what for others is impossible to see. In this sense the artist and the community of artists, as they have studied the same history of visual relations and have experienced ensemble the constant reinvention of the objective world in which they live, create another system of relations which in some cases are the antithesis of those of the mainstream. Together they propel another type of vision into the future, one which one day may possibly be understood as conventional. These images are found in the border zones interstitial and minority spaces. “If art, or “the will to art,” supposes a people that is missing, that is yet to come, it is because there arises in a peculiar condition the condition in which something new may arise. For novelty in this case is not to be confused with known or visible fashions and the manner in which they are manipulated and promote, but on the contrary, is something we do not or cannot yet see is happening to us...” (11) This tendency to go outside convention in order to deterritorialize new information seems contrary to the visual/cognitive ergonomic paradigm that underlies some of this argument. But the tendency to transform these indeterminate spaces through art is part of a process that I will show is extremely important to the nervous system. Through introducing entropy and increased variability new combinations of sensations and perceptions become possible some of which by chance increase the efficiency with which the brain can code the information of the world. For as I will explain shortly the brain one is born with consists of an overly abundant nervous system in regard to the number and sensitivity of the population its’ neural elements. Gerald Edelman calls this the “primary repertoire”. (12) This primary repertoire is sculpted and pruned by the world that the individual is born into, what I am now calling the real/virtual interface. The real/virtual interface is a laboratory where new combinations of objects and relations are in constant flux as part of shifting experimental paradigms. In the end these experiments, which remember are the result of the shifting and changing social, political, economic, psychological, cultural, historical and aesthetic relations create new objects and relations which then are inscribed in novel networks and network systems. The infinitely variable nervous system is well suited to a variable cultural landscape, the upheavals it creates and the changing visual landscape it dictates. We will see this to be an important impulse of avant-garde cinema as well the avant-garde in general.

Just as the photographer is essential for directing the gaze and aligning the camera along an assumed axis towards that in the “real” which has hailed him/her, he/she is also essential for discovering in the pictorial surface of the photograph other clues to the nature of the image and what it represents. In the transition between the three-dimensional world and its transcription into a two-dimensional surface, changes occur in its representation as photograph which begin to give us clues as to how another kind of coding and transformation, that occurring in the nervous system will occur. On the most superficial level the image is still and frozen. The leaves of trees no longer rustle in the wind, the running figure is frozen mid-step and the sun remains forever behind a silhouetted cloud. Of course photographers using long exposure, stroboscopic methods, camera movement and multiple images have attempted to incorporate a sense of time into its static surface. Some of these methods would find there way into

making films. However for the most part the photograph is about spatial relations. The coding of temporality will have to wait for the invention of cinema. But even its spatial relations are subject to interrogation. Through use of focal length and aperture setting that space can become contrived and distorted through manipulations of depth of field. Culturally the problem becomes even more complex when we look at the history of cultural memory as it is delineated in the photographic archive. Although this is not the treatise of this text I think it has important implications for the way that memory is stored and retrieved.

If we believe Peter Gallassi that problems of representation that were found in landscape painting were fast forwarded into early photographic activity which was directed towards imaging nature, one might be able to say the same of history painting. (13) That is to say that the way photography represented history found its schema in the constructed spatial relations of history painting going back to the Renaissance. We are also aware of photography's role in the representation of history and the construction of a believable grand historical pictorial narrative. This shift from the hand of the painter to the technological photographic apparatus was fraught with difficulties caused by the apparatus of the camera itself. The investigation of which has both plagued and inspired photographers since. Thus, as alluded to earlier, issues such as parallax, depth of field and film speed have affected the way the archive looks and what type of pictures, especially early on, were even possible. For example only moving people and objects coming toward the camera were possible to photographers using very slow lenses and films. Individuals photographed at this time appear stern and stiff because the subject was required to be still for up to four seconds and many times had their neck supported by a brace that attached to the chair in which they sat. But beyond this technological problem there were cultural biases that played a role in what and who were photographed; biases that affected the look and reading of this memory system as much as the technology itself. For the eye of the photographer as it scans the visual terrain and is tuned towards a plethora of possible images selects from that vast array images that tell a story that is culturally biased. It is well known that photography represented the history of bourgeois society, as did painting before, leaving the poor and disenfranchised forgotten. Beyond the actual taking of the photographs there were issues of how the photographs were stored and archived. It is reasonable to assume that the rich and powerful had the means to take care of these images and they therefore would last through time and remain as examples of how people lived and dressed. In reading all the photographs available from that period a high percentage of those that remain will be of those bourgeois cultures thus skewing any interpretation of how people may have lived at that time. Post-modernist photography, which is more interested in investigating apparatus and unveiling its' form and method of production than its modernist counterpart, has been acutely aware of these problems and has exposed the nature of historical truth as it is manifest in the photograph and how it can be corrupted. Alain Jaubert systematically investigates the methodology of this corruption in his seminal book, "Le Commissariat aux Archives, Les Photo Qui Falsifient L'histoire". Using a variety of techniques from retouching, cropping, pasting and erasing archivists were able to change the way history was appreciated through the photograph. For instance in many instances the image of Trotsky was removed by these various techniques in order to substantiate Stalin's claim as the rightful heir to Lenin. (14) This tendency is further informed by Eduardo Cadava "The flood or blizzard of photographs "betrays an indifference toward what the things mean" and thereby reveals the historical blinding or amnesia at the heart of photographic "technicalization". Substituting for the object and its history, the image represents a trait of the world that it at the same time withdraws from the field of perception. The event that gives the age of technological reproducibility its signature is the event of this withdrawal from sense." (15)

Crucial to this analysis is that what is represented and thus what makes up history, as we know it through images, is an archive of images that is the result of a construction of a world that can be photographed and yields snapshots. The world takes on a photographic face. This same

analysis can be used to look at cinema as well. As we saw first in the films of Leni Reifenstahl such as “Olympia” and the media’s presentation of the O.J. Simpson Trials. “Blow up” is about a discovery and unveiling of that corruption while at the same time a total acquiescence to it. When Thomas is wandering about the park snapping photographs he becomes caught in the phenomenological moment of ecstatic seeing in which his body is elided with the scene of which he is a part. He is unconscious and unaware of the murder that has taken place directly in front of him. His desire has become imbedded in a creative process in which formal rules dictate the direction his camera/eye moves, the amount of space each frame dictates, the position of certain objects in that space and the relations they have to other objects in that shared space. These learned strategies of seeing are imbedded in certain patterns of behavior that control the body such as the tilt of the head, the position of the hands and fingers on the shutter release and focusing ring and even the distribution of muscle tone which controls even his posture. For photographers these postures are imbedded in the actual act of taking a photograph and like walking, breathing, and speaking over time become unconscious. As such they become part of the photograph themselves as that posture in some ways determines the space and orientation of the image. Gary Winogrand’s, “London.c.1967”, “New York.n.d.” and “New York,1962” are just a few examples that come to mind which are examples models of how bodily disposition becomes an unconscious signifier in photographic meaning while at the same time debunking certain predetermined academic postures. Superimposed on culturally derived methods of seeing, such as culturally derived ideas of closeness, harmony and palate, these motor as opposed to sensory adaptations become automatic. In the moment of the act of photographing these learned patterns act to enhance the ability to see, snap photographs and shoot fast while at the same time inhibiting full awareness. They direct the gaze as well as configuring composition. As such they are imbedded in the resulting photograph. It is only through an engaged act of staring and visually searching, in some cases resorting to visual aids like the magnifying glass Thomas uses to inspect his photographs in his studio, that those conventions of seeing, which initially direct the gaze into spaces of knowing but which eventually lead it into lacunae of disinformation, can be overcome.

Avant-garde cinema and the brain

“Blow-up”, as its’ photographic title implies, is part of a much larger impulse of 1960’s avant-garde cinema to connect cinema to its proto-cinematic roots, the motion studies of Etienne-Jules Marey and Edward Muybridge and the single long takes of the earlier Lumiere Brothers’ films. Andy Warhol’s “Empire” subverts the Hollywood narrative film genre by presenting a single image with slight variations for the entire film. Yoko Ono’s “Buttocks” harkens back to Muybridge motion studies. The processes of mechanical reproduction, both his use of the camera and the enlarger, and collage, his reassembly of the images on the studio wall, that define Thomas’s investigation of the “real,” are a regression of the cinema to its ancestral derivations in photography of the late nineteenth century. The evolving scene of the murder is deconstructed into a set of motion studies as the serial nature of the event is broken down into single shots. Film is montaged, speaking only about photographic montage and not cinematic, into the photo-still and through this process, the true nature of reality unfolds. It is this process of montage, that links avant-garde cinema to the brain. The act of selecting specific examples from the whole host of images, or decoupage, running before our eyes during the cinematic spectacle and their later diegetic reconstruction, is metonymic for a similar process occurring as we witness the spectacle of the “real/virtual interface” and vice versa.

Take a moment to conjure up memories from your childhood. From the almost infinite number of images and their relations construct a story with the faces of friends. Change the locations with these friends. Imagine them today. The story that these memories conjure ,as they are projected upon the immaterial screen in your minds eye and viewed, are a product of ones’

desires, needs, and identity at the particular moment of its' imagining. A non-narrative, avant-garde film is set up to do the same thing. The stream of images that flow in front of the audience are constructed in such a way that the audience is able to "create" a variety of narratives from the same information. The most extreme cases of this kind of film can be found in Stan Brackage's, "Dog Star Man" or the early films of Maya Deren and Alexander Hammid such as "Meshes of the Afternoon". Each person creates their own story from the flow of fragmented images embedded in fractured plots that erupt and fly upon the film screen in a free and unencumbered way. The fragmented nature of these bits and pieces allows them to be bound and collaged together in a myriad of ways creating innumerable plots and stories; stories that have as much to do with cultural context and ideological climate as they do with character development and plot analysis.

This process of selection/montage is reminiscent of Louis Althusser's concept of "interpellation" in which ideology constitutes concrete individuals as subjects: ideology hails its subjects (16) That an ideology is adopted by those that it resonates for and is reified, it becomes part of their body. The immaterial visual landscape that is projected upon the screen is one that, as mentioned above, is full of ideological, cultural and aesthetic determinations. Together they form networks of signifiers that are defined by these determinations in space and time. But cinematic time and space or the experience of cinematic time and space is very different from that which the body responds and is bound to in its normal relations with its experience. These differences are even more pronounced when we compare linear time found in most narrative Hollywood films and that of non-linear time found in its avant-garde non-narrative counterparts. In linear time the story or narrative follows a time line with beginning, middle and end. The film moves seamlessly across the screen in front of a passive audience. In non-narrative film time can be manipulated as an apparatus of cinematic production. The plot rides on its feedback and feed forward disruptions and the audience consciously or unconsciously builds the story from these temporal fragments. Recent Hollywood hybrids like "American Beauty" and "Memento" combine both strategies in their attempt to mimic those relations of the real/virtual interface. This is extremely important for two reasons which later on will be further elucidated. First of all these experiments in time that define avant-garde cinema are mimetic of temporal relations already present in culture and society at large and are responsible for its increased density and complexity. They are endemic to the internet and the way, for instance in hypertext, meaning is piggy-backed onto the same bits of space and time. The very fact that Hollywood has adapted these strategies is in itself an indication of how prevalent these strategies are and how important they are to the viewing audience who now considers them normal rather than odd and cognitively challenging. Secondly these experiments with the application of temporal strategies of non-narrative film have created new paradigms upon which new temporal formations can be described that later will have implications for information systems and for what I call "visual and cognitive ergonomics. As we will see in our description of "Blow-up" more and more cinematic time and now virtual time is being embedded in the "real" as it becomes transformed into the real/virtual interface. The implications for the body are enormous. For the developing brain adapts to these new space-time relations as neurons and neural networks within an existent variable population compete for this newly coded information. Those neurons and networks which most easily can adapt to these newly configured space-time continuum of the real/virtual interface will survive and undergo what J.P. Changeux has called "exuberant growth". (17) Those neurons and networks whose electrochemical potentials are at odds with these new relations will undergo apoptosis or cell death. (18) In the end the brain undergoes a kind of transformation or mutation in which a new kind of subject or observer is created. I refer to this newly sculpted brain as the "cinematic brain" and the person who is the carrier of such a brain "The Mutated Observer". This cinematic brain has important implications for our understanding of "Blow-up". Thomas's dilemma in this film is a product of a schism or rift between his "cinematic" and "real "brain.

Recent post-structuralist discourse has redefined the role of the audience in constructing meaning from the disparate signals introduced by the cinematic experience. Authors like Jean-Pierre Oudart and Stephen Heath introduced the notion of the “suture” to describe the way the spectator is connected to the representations flowing across the screen of cinema. (19) That non-narrative film introduces fragmented objects, signs and temporal relations into its basic structure to be easily assembled and disassembled makes it easier for the audience to perform similar acts of assemblage and dis-assemblage. The film can then contain a multiplicity of narrative structures simultaneously which act in parallel. Different groups, for instance those constituted by individuals with different cultural background or personal histories, can coexist within the same audience and may construct separate stories from the same film. On the other hand there may be points in the film in which these different audiences may agree. These can become nodal points around which a consensus concerning the overall meaning of the film can be constructed while still being consistent with a personal reading. Different nodes can participate in the same narrative and the same node can participate in different narratives. Each context slightly alters each node's meaning as it is shaded and colored by the differing stories it is embedded in. Later on in this discussion we will see how this multiple narrative structure, parallel dimension, fragmented nature and nodal construction have important implications for theories concerning the development and construction of the neuronal structure of the brain. For instance Edelman has called neural networks that participate in multiple larger networks degenerate. (20) For clarity sake, because the section on the brain needs a great deal of introductory information, I would like to continue with this basic discussion of cinema.

Scopic Regimes of Modernity

The meaning that cinema has for us is to some extent related by its close relation to reality. (21) Film is filled with objects with which we are familiar. Their meaning to us and their constructed relationship to each other mimic those relations with which we are already familiar in our daily lives. But the meaning those objects have and their relations are determined by static and changing aesthetic, cultural, social and psychological forces which, for instance, control how those objects are made and used or their spatial arrangement in a room. Marcel Duchamp's use of the urinal, wine rack and shovel are a testament to the way that the meaning of neutral objects change and are transformed through simply re-positioning of them from their original context as utilitarian objects into one in which they are appreciated as sculptural art objects. Objects that are bound by very different social, aesthetic, psychological and economic histories and as such are appreciated in the context of a history specific to that kind of object. Duchamp's, signed R. Mutt, “Fountain”, 1917 is therefore embedded in a history of sculpture that begins with early man's use of figurative fetish objects in religious ceremonies, continues with Michealangelo's, “David”, followed by Robert Smithson's, “Spiral Jetty”, 1970 and today exemplified by Gabriel Orozco's “ET4. LA DS” 1993 (transformed Citroen). Although these other sculptures do not emerge from the same conceptual framework as “Fountain, 1917” they nonetheless help define what Duchamp's three-dimensional object is and what it is not in terms of a history of sculptural objects displayed in a gallery or museum. But spatial and temporal relations have a separate history as well and like their object counterpart these relations are affected by the political, social, psychological, historical, economic and aesthetic relations, just to name a few, in which they are embedded. Therefore space and time can be seen as devices just like our visual apparatti and the way space and time operate can be viewed as an indices of cultural change. In fact each culture and generation invents spatial and temporal constructs that are specific for the changing needs they confront. These constructs become folded over one another rather than simply superseding each other, one displacing the next in a linear progression. This is especially true of what Martin Jay calls the “scopic regimes of modernity” in which a succession of context dependent notions of space developed throughout history become collaged together combining to create our contemporary notion of space. “For

as Jacqueline Rose has recently reminded us, “our previous history is not the petrified block of a single visual space since, looked at obliquely, it can always be seen to contain its moment of unease. In fact, may there possibly be several such moments, which can be discerned, if often in repressed form, in the modern era? If so, the scopic regime of modernity may be understood as a contested terrain, rather than a harmoniously integrated complex of visual theories and practices.” (22) So what are these different scopic regimes of modernity and how do they configure a context driven space? What role has cinema and new media played in reconfiguring space and time and how have these affected the construction of the twentieth century observer of which Thomas is a prime example. These are some of the questions I would like to now address.

The first scopic regime of modernity alluded to by Martin Jay is Cartesian Perspectivalism which is a combination of the Renaissance notion of perspective developed by the artist Brunelleschi and written about by Alberti and Descartes’ idea that visual representations are projected upon a screen in the brain and rationalized by the mind. The basis of this idea came from a desire to code the three-dimensional world onto the two-dimensional surface of the painted canvas to be appreciated as a three dimensional picture. It required an unemotional, privileged, monadic eye that was in league with scientific accounts of the world. Objects existed in spaces fixed by specific x, y and z coordinates that were defined by connected opposing five sided triangles whose apices touched the fovea of the observer’s retina and the paintings vanishing point. This space created a stage where various narrative structures could and did unfold. I will later argue that it is this Southern tradition of the Cartesian Perspectival window that forms the basis for the Hollywood narrative film whereas avant-garde film is more in synch with the Northern tradition of art of the grid that evolved in the low countries of Holland and Belgium in the seventeenth century. “Like the microscopist of the seventeenth century-Leeuwenhoeck -Dutch art savors the discrete particularity of visual experience and resists the temptation to allegorize or typologize what it sees, a temptation to which she claims Southern Art readily succumbs.” (23) Unlike its predecessor it elevates the art of description over narrative and assumes the existence of objects prior to the observer’s position in front of the canvas. The Northern tradition, sometimes allegorically described by the term Baconian Empiricism, redefines space and time relations as finite and infinite simultaneously in opposition to its Cartesian counterpart. Finite in the sense that objects and space could be described and infinite because there was no limits to those spaces and the objects that inhabited them. In its grid it reinvents time and space relations that are essential to changing notions of the limits of space and time itself. For the Dutch realized, sometimes unconsciously, that different worlds existed simultaneously in the optics of the microscope and in the endless horizon of the sea. Whether drawing the minute world of the space of a cell or redefining the endless space of the sea as a map they understood that space and time went beyond the space of their rendering, continuing forever. When it was time for the painter to stand in front of the canvas these same strategies found their way into his/her “recodings” of the landscape and still life. The grid was an invention and a tool like perspective to represent a world that was now understood differently and thus needed to be represented differently. It is no wonder that this art of describing would predate the invention of photography. “...the art of describing also anticipates the visual experience produced by the nineteenth-century invention of photography. Both share a number of salient features “fragmentariness, arbitrary frames, the immediacy that the first practitioners expressed by claiming that the photograph gave nature the power to reproduce itself directly unaided by man.” (24) This sentence could end “unaided by man” over and over and over again. This is, as we will see when we follow the trajectory of the work from Etienne-Jules Marey and Eadweard Muybridge to Andy Warhol and Yoko Ono , a kind of fundamental dictum of minimalism and experimental film. The grid forms a theoretical framework in the early sixties where the strategies of artistic production can be played out. The third schema or model to influence modern vision is that of the Baroque which participates more like an anti-model. Here the geometricalized spaces of perspective and the grid are

eschewed for one likened to a mirror that is unreadable, opaque, distorted and out of focus. It moves the viewer out of visual discourse altogether and replaces it with a tactile or haptic quality. The body, which was dethroned by Cartesian Perspectivalism, here makes a startling comeback with the return of a sublime eroticism.

The final two models that I would like to discuss are assembled from these first three but extend their arguments. They are Warped space and Mutated Space. Warped space has recently been championed by Anthony Vidler in his book that carries the title “Warped Space: Art, Architecture and Anxiety in Modern Culture”. Warped space is the result of, on the one hand, the role of the psyche in the perception of and creation of space and on the other the role of the artist projecting his or his discourse on architecture from without. For the purpose of this text I would like to focus on the former. The psychic space is in some ways an adaptation of Kant’s notion of the sublime space except here the body’s anxiety has been transferred to the audacious space of the piazza and its subjective feeling of agoraphobia from the supersensible response to mountain peaks. “Astonishment that borders on terror, the dread and the holy awe which seizes the observer at the sight of mountain peaks rearing themselves to heaven, deep chasms and streams raging therein... In the safety in which we know ourselves to be, is not actual fear but only an attempt to feel fear by the aid of the imagination, that we may feel the might of this faculty in combining with the mind’s response the mental movement thereby excited” (25) The sublime is a condition of reflective judgment and not a characteristic of the object itself. Kant goes further in his analysis of the sublime and links it to the estimation of the magnitude of things by apprehension and comprehension. He posits that the mind in its apprehension of a thing breaks down that object into identifiable parcels or quanta and reconstructs the object of regard in the mind by binding these quanta together into a larger whole. The problem comes when the estimation of magnitude is beyond the mind’s ability to hold the sensation long enough to attach the forthcoming sensation to it. “For when apprehension has gone so far that the partial representations of sensuous intuition at first apprehended begin to vanish in the imagination, while this ever proceeds to the apprehension of others, then it loses as much on the one side as it gains on the other, and in comprehension these is a maximum beyond which it can not go.” (26) Inherent in this notion of the sublime is the concept of “beyondness” which for Kant like Vidler concerns the limits of the body to negotiate space. A space which architecture, as it embeds itself into the “landscape” of the city, first configures according to the bodies perceptual abilities and then challenges its psychic stability. Warped space is the product of interlaced historical strategies of spatial and temporal configuration of the new metropolis or Grossstadt which are linked to specific psychopathologies. Agoraphobia, the fear of open space, hysteria, physical illness that is defined by symptoms incommensurate with anatomical possibilities, vagabondage and ambulatory automatism a kind of amnesia for traversed space and severe distraction, the direct result of the destruction of the space of judgment or reflection by the assault of rapid communication and technological invention where, according to Benjamin, “space was for rent” were all caused by the new perceptual challenges imposed by the new urban environment. It is this last psychopathology that has the most relevance for our discussion of the constructed new observer of the twentieth century and the cinematic brain. I would like to argue that the cluster of psychopathologic states here described resulted from the transformation of built space that photography and cinema incurred through its production in architecture. “that modern architecture becomes modern not simply by using glass, steel or reinforced concrete...but precisely by engaging with the new mechanical equipment of the mass media, photography, film, advertising, publicity publications and so on.” (28) This modernism created new spatial/temporal conditions which required a neuro-perceptual apparatus that was adequate to their challenging reconfiguration of spatial temporal contingencies. “In modern cinema images cease to conform to tonal rhythms-spectacular moments give way to the most banal ones...without a sense of rational logic. In the end the cinema trips into an ambiguity so overwhelming that the imaginary and real become

indiscernible...every perception is an hallucination”(29) It is my opinion that these mental conditions were the result of an inadequacy of the neuro-perceptual system, configured according to the spatial and temporal constrictions developed in the late eighteenth and early nineteenth century, to deal with challenges that a new condition of time and space exploding out of Realism, captured by photography, redefined by cinema and imbedded into a new urban mediascape would impose.

Mutated space is a term that has been used in various contexts and in fact has even substituted for the term “warped space”. (30) I would like to use it here to signify a specific mental condition of space/time relations as they become coded for in the brain. Mutated space is a specific architectonic condition of the neurobiologic substrate which is the resultant condition of a brain that attempts to code for the ever evolving conditions of what we now appreciate as the real/virtual interface. (31) I have already alluded to some of the theories of Edelman and Changeux concerning the way that culture inscribes itself on the brain in the transformation of what they refer to as the primary repertoire into the secondary repertoire and I will have to ask for the readers continued patience for a full explanation of these neurobiologic theories. Suffice it to say that whereas warped space and its psychic correlates are the result of reaching the limitations of the brain’s ability to deal with the changes of the “grosstadt”, mutated space is the result of the brain’s innate changeability. This flexibility to adapt to new environmental cues is the result of a kind of neural plasticity in which a highly variable, the firing specificities of the neural population are widely distributed over many kinds of sensory stimuli, and overpopulated nervous system is pruned, so to speak, through a process of cell death and exuberant production. (32) The constantly evolving environment is the result of a multiplicity of immaterial relations, such as psychological forces, sociologic cues, economic stimuli, technologic adaptations, and aesthetic styles, that interact together on and through the material world of objects and their relations and the virtual world of televised images, billboards, cinematic images, computer screens and computer games. The history of objects, their relations and the spaces they occupy as well as the history of their virtual counterparts act to write a type of cultural memory. Each entity is the resultant of a multiplicity of vectors. On one hand each has its own historical antecedents and on the other each is adapted to a particular contemporary context. The computer screen was adapted from a television screen that was adapted from the movie screen that was adapted from a painting and so on. These specific and separate evolutionary systems have an interacting counterpart as well. Each come together at sites of interaction called nodes in which for instance technologies developed for one machine can be adapted to be used in another. In this way these memory systems develop and change together and as they do they cause a domino effect throughout the whole system. It is this evolving system of relations that the brain must adapt to. The mutated brain is the term used to express the constantly evolving system of interacting neural networks that are the result of this evolving world. The next section will deal with a specific kind of interaction that resulted from the development of cinema but is relevant for new media as well.

Cinearchitectonicneuro-synaptologies

“Deleuze describes the brain as a relatively undifferentiated mass in which circuits aren’t there to begin with; for this reason, (c)reating new circuits in art means creating them in the brain too. The cinema does more than create circuits, through, because, like a brain, it consists in a complexity of images, imbricated and folded into so many lobes, connected by so many more circuits. While cinema can simply reiterate the facile circuits of the brain, appealing to arbitrary violence and feeble eroticism, it can also jump those old grooves, emancipating us from the typical image-rhythms....opening us t a though that stands outside subjectivity...” (33)

Cinearchitectonicneuro-synaptologies (CAN) is a term that describes a process by and through

which photographic, cinematic and now virtual space, their formal spatial and temporal properties, become first imbedded in architectural forms and discourse and then inscribed upon the brain. Through their connection to photons of light photography, cinema and the visual components of virtual space share with the eye-brain axis a common currency. In the case of photography and cinema light emanating from the objects of the cameras regard are captured by the apparatus of the lenticular system and focused upon a specialized membrane, the film emulsion, where a specific photochemical reaction takes place. The history of photography and film has in essence has been a continual readjustment and reinvention of these components in a process of frequent adaptation. The requirements that an evolving time-space relationship in which the need for faster and faster lens systems, lenses that had larger apertures to capture the light without compromising optical quality caused by chromatic and lenticular aberrations, faster films with greater sensitivities, new cameras which could capture the essence of movement itself and finally ever more refined strategies to capture the attention of an audience with an ever increasing appetite for visual sensation and an ever increasing threshold of believability. In the case of the eye-brain axis the stimulation of specially evolved light processors in the retina, a thin transparent membrane that covers the spherical back of the eye, which communicate and transmit information along a specified route called the anterior and posterior visual pathways to the far posterior aspect of the brain called the visual cortex. (Figure 3)What connects these systems is that each is tethered to the electro-magnetic qualities of light. That the history of the neuro-physiology of vision, the invention of devices to research light and the history of the invention of photography, proto-cinematic devices and cinematic technologies occurred together and were linked to each other is, I believe, no accident. (34) That these devices as they captured the attention of an eager public would find themselves embedded in other aesthetic practices that also investigated vision such as painting, fashion and architecture is no surprise. Artists like Georges Seurat, Frantisek Kupka, Jacques Villon, Marcel Duchamp, Carlo Carra, and Giacomo Balla all created works of art that were photographically and cinematically inspired. It was only natural that these strategies, experimented with upon the two dimensional plane of the canvas would find there way into architectural practice as it was conceived, built, photographed and disseminated. It would find an immaterial basis like the light that first bathed and reflected its surface and later would become a kind of metaphor or analogy for built space itself in the work of John Hejduk and LeCorbusier. (35)

In the next chapter I will make the point that these relations as they are immaterial and therefore act invisibly are made visible by specific optical technologies. These technological devices like the camera obscura, the camera lucida, the photographic and cinematic camera and today information and communication technologies (ICT) (Figure 4)are in fact each societies response to these invisible relations and their desire to make them visible. It is the complex interaction of these immaterial relations that produces special technologic requirements that necessitate refinements of older apparatti or the production of brand new ones. A similar story can be told for the conceptions of time and space. They function to redefine a special set of circumstances in which they are imbedded and they produce a context in which the constantly mutating relations, previously described above, can mix and interact . New conceptions of time and space create a context in which specific sets of ideas, which had been previously disproportionate with each other, are now able to align themselves to form new concepts which in turn generate the need for new instrumentations to record them. The Theory of Relativity, The Heisenberg Uncertainty Principle and The Schroedinger Wave Equation disrupted then known facts about time and space and would have to wait many years for new technologies and instrumentation to prove their pronounced validity. These kinds of discoveries generate new complexes of information that require new definitions of time and space. This process is not always as linear as I have described it here. Many times there are fits and starts, switchbacks even bushwhacks, if I may use such a metaphor, in which information which appeared inconsequential is now seen as significant and new bits of information are

transformational and revolutionary as to turn everything upside down. Such is the case for our recent history of optical technologies of which photography, film and cyberculture form an integral part. From the simple devices for the creation of pleasure for which all these instruments were originally invented these instruments, like a lightening flash, became influential in the generation of new ideas about space and time that would influence Marcel Duchamp's "Nude Descending a Staircase" 1917 and Albert Einstein's Theory of Relativity. These changes would first take place in the spaces accorded to them by the image, frame or screen followed by their indirect affect on visual culture in the public space of billboards and giant video screens and finally by the impact they have had on the skin of architecture, fashion, and design. In the end I will argue that the new strategies of configuring time and space that are experimented with locally in each specific media and its later transcription into the broader spaces of visual culture are part of a much larger tendency in which information, and its processing, becomes more dense: that the curved dimensions of space and time can be packed with ever more and more information by incessant folding and plication. (36) I will define this process as visual and cognitive ergonomics. The overall affect of this process is in the end on the brain itself and the way it codes information. I will hypothesize a bi-directional process in which these new experiments with time and space become in(cor)porated into the way neurons and neural networks at a local, for instance the visual cortex, and global level, in which the areas of the whole brain are involved, become organized and interact. These neural networks are configured according to networks of relations that occur first in the visual landscape and are formed from interconnected signifiers. Evolving networked relations in the real world configure evolving networked relations in the brain. For instance primitive man hunting for game might put together animal tracks, the smell of fresh urine, and animal fur tethered to a broken branch as evidence that what he is searching for is nearby. In the modern world these signifiers can vary from groups of objects that have purposely arranged to produce specific meanings, like furniture arranged on a stage in a play, or they can be simply groups of texts consolidated together on a billboard advertisement. When these signifiers are constructed in such away, in the boardrooms of advertising companies and the laboratories of perceptual psychologists, that they "capture" our attention they become phatic signifiers. Paul Virilio calls this a "process of message intensification" and defines a phatic image in the following way. "The phatic image-targeted image that forces you to look and holds your attention-is not only a pure product of photographic and cinematic focusing. More importantly it is the result of an ever-brighter illumination, of the intensity of its definition, singling out brighter only specific areas, the context mostly disappearing into a blur."(37)

As we live in a world in which the visual landscape is a clutter of these phatic signifiers competing for our attention. I say competing because within the ever-developing field of phatic signifiers new types of signifiers are always being developed. Simply look at the special affects used in Sci-fi movies of the fifties and compare them to those used in the Star Wars Trilogy or witness the effect of the change in movies with advent of Technicolor. What captured our imagination then seems funny and primitive. But special affects are not limited to the movie theater they are happening everywhere constructed images are being formed, located and distributed globally. The devices of cinema, the stage, lighting, cameras, editing machines, special computer programs like after-affects, are being used in television, advertising, and news bureaus. Just as we witness an evolving genealogy of cinematic devices and concepts of the representation of space so to is there a genealogy of specialized devices of special effects to intensify the sensorial and perceptual effect. Ever more sophisticated and intense phatic signifiers are being produced and they are pushing out there more unsophisticated progenitors from the visual landscape in a process similar to natural selection accept the real selection is taking place in the brain as these stimuli compete for the brain's and its' neuronal attention. The field of significant signifiers becomes the field of phatic signifiers. Within these fields relations grow which link phatic signifiers together. For instance the use of movie stars to sell products has recently become very popular, the appropriation of movies to structure television

programs and vice versa are some examples of the networking of these signifiers in to grand schemata of signification. The visual landscape becomes a network or field of phatic signifiers. This network, as it is composed of elements that developed together in synch and erupted out of the same desire to create an ever more refined and intense image and the end product of selectionist forces that prune off its detritus and excess, is a very efficient system of relations. As they are technologically based and have been created out of the same linguistic surface, in the case of digital technology the binary system, their efficiency translates into a more competent use of space and time. We know this is true as we are witness to the invention of smaller and smaller microprocessors to run smaller and smaller computing devices which have more and more computing power. This in the end has lead to more and more complex abilities and has allowed to society to investigate more and more complex entities including newer concepts of time and space like black holes. (38) These networked relations as they have evolved in the world become the stencils upon which the networks of the brain are modeled. Their complexity and efficiency find their counterpart in a selected neuro-biologic apparatus. As a result technologic apparatti, space and time apparatti and neuro-biologic apparatti all develop in tandem and themselves create a complex set of relations. A little later I will show how these artificial phatic signifiers compete for the neural space of memory with non-artificial stimuli. I will build an argument around the development of a mutated observer of the twentieth-century, of which Thomas is a good example, on a hypothesis that these phatic signifiers are “selected” for by brain above and beyond their non-artificial “real” counterparts and are thus remembered easier and more intensely and in the competition for limited neural space become its master. Before I develop my argument further I would like to step back a little to discuss a fundamental hypothesis and somewhat still controversial theoretical framework of neurobiology called “Neural Darwinism” or “Neural Selectionism.”

Neural Selectionism and Culture

Gerald Edelman in “Remembered Present” building on the theories of Hebb and Pierre Changeux, constructs a concept of cerebral development and cognition based on the Theory of Neuronal Group Selection. (39) This theory posits that we are born with an overabundant population of neurons that he refers to as the primary repertoire. (40) Through a process of amplification of sensitized neurons and pruning of non-essential ones the brains’ micro-architecture, the structure of the connections of the units of nervous system referred to as neurons, which can be visualized with a microscope, is sculpted by relevant inputs. The primary repertoire is the result of genetic influences that describe a blueprint in space and time that is followed by millions of migrating neurons during development. A “secondary repertoire” is formed after conception as the result of an interaction between the world that person is born into, which is in flux and can change from one generation to the next, and the neurons and connections of the primary repertoire. Those neurons that develop enhanced firing patterns do to inputs of groups of sensations generated from objects, their signifiers and the spatial and temporal relations that exist between them are selected for over and above those that are not similarly stimulated. These selected neurons are amplified because they are stimulated by these relevant inputs over and over again. Remember that objects as conglomerates of individual sensations share with other objects similar sensations. Therefore the same neuron that codes for that fragment of the object can be stimulated by the same sensation from a multitude of objects that share that attribute. Those neurons that are not stimulated undergo a process called apoptosis and die off. “ The concept that there are mechanisms that act to retain those pathways in which patterns of external stimuli induce activity and eliminated potential connections not so activated has been termed functional validation by Jacobson and selective stabilization by Changeux and Danchin.” (41) The resulting population of neurons reflects these interactions and is dominated by those that are frequently stimulated. These sources of stimuli are woven over and over again into the network of relations that exist in the world

apart from the body. In the case of vision, visual objects, their signs and relations have many synchronous and interactive qualities such as color, shape, motion, and form. The history of painting, photography and cinema is characterized by an investigation of these qualities and their representation and non-representation. But it turns out that the visual cortex of the brain, which sits in the far posterior aspect of the brain, consists of multiple functionally specialized areas with which to receive these inputs. They are called V1, V2, V3, V4, V5. V1 and V2 mostly send information to the other areas. V1 is called the cortical retina because a topographic map of the retina can be recreated on it. Without getting too deeply involved with an explanation of the neurophysiology suffice it to say that each area has a particular function such that V4 is responsible for color vision and V5 for motion. But we know that objects and their relations share many of these qualities simultaneously. An apple is red, it has a specific shape that we recognize as apple, it is stationary unless given a push and it exists in a physical milieu that gives it a context. One neuron cannot code for all this information and a network of neurons is required. According to Hebb neurons that fire together wire together. As a result of simultaneously coding for all this information together a neural network is formed. When a network is confined to one area of the brain it is called a local map. Local maps like the ones for the visual cortex also exist for the senses of hearing, taste, and touch. Many times however the visual characteristics of an object are connected to other sensory qualities such as smell and sound and emotional qualities like love and pain that are perceived by other parts of the brain. Many times visual sensations will necessitate a response of the whole body and musculature. In this case a sensory-motor loop will be instigated defined by specific neural networks that connect the posterior part of the brain, where information for sensation is located, to the more anterior aspects where action is cognated. This sensory motor loop as we will see will be very important when we discuss classic and modern cinema in relation to movement and time images. In these cases the networks expand beyond the restricted domains of a particular sensory system to create what are referred as global maps. Local and global maps are under the same selective pressures as the neurons that form them. Just like neurons neural networks are amplified if they are repetitively stimulated. This may result from the same inciting stimuli or it can result from a network's participation in larger networks in which they play a role. The apple, of our previous example, can play many different roles in many different scenarios that take part in the real world as well as those which are included in memories and obsessive fantasies. In the end the brain, its neurons, synaptic connections, and neural networks are sculpted by the inputs it encounters after birth. The question then becomes what if these inputs are artificially constructed rather than real or organic. What happens when these artificial stimuli are engineered to be more sensational and intense because they have been created with the brain in mind. What happens when fields of phatic supersignifiers manufactured with social, political and psychological intent compete in the space of the world for the brain's attention. I will try to answer some of these questions a little later.

Eye-vision, Camera Vision

The act of photographing as an act of will is the repetition and invocation of a number of Neurobiological events coordinating the desire/value in seeing with the act of shooting. Thomas's body movements, which have been mentioned previously in the literature on temporal discussions of "Blow Up", are a kind of improvisational performance in search of the perfect angle he attempts to discover an alignment that brings a harmony between his subjective phenomenological self and the machine/camera. This performance stems from his desire to find the perfect balance between the optical axis of the camera with the optical axis of his eye. It is the non-resolution of these two opposing factors that lies at the heart of the conflict and disjunction of "Blow Up." For Thomas is in many ways the quintessential twentieth century observer. The latest model in the creation of a subjectivity that begins in the chamber of the camera obscura matures through the elided space of the stereoviewer,

and reaches a sort of apogee with the experience of cinema and today new media. The central problem explored by this film concerns the problem of the postmodern observer, an observer in whom fiction and reality are interchangeable in the construction of the observing subject. The misalignment of the phenomenological body and the apparatus of the camera is for Thomas a problem of misalignment of how and by what means he identifies “himself”. This “disjunctive subjectivity” is the result of a steady reconfiguration of the observer and the associated substitution, the acceptance and finally dependency of the simulacrum as real. The technological shifts that marked changes in the representation as defined by the camera obscura, the stereo viewer and the phenakistoscope marked shifts in the viewer / observer relation to reality and his/her willingness to allow these projections to substitute as real facts in the construction of consciousness and memory. “Blow Up: Photography, Cinema and the Brain” is an essay which analyzes the reasons and affects of this misappropriation of the simulacra of cinematic projection on the construction of long term memory and its consequence for the construction of subjectivity.

The invention of film was a logical result of technological advances and the matrix of sociological and cultural facts that surrounded and enveloped it. The incarnate observer of the nineteenth century becomes the disincarnate body alone in the passivity of watching, which is so characteristic of the cinematic observer. Jonathan Crary, although focusing on the seventeenth, eighteenth, and nineteenth century observer is aware of certain implications in his predictions for the twentieth century: “The formalization and diffusion of computer-generated imagery heralds the ubiquitous implantation of fabricated visual “spaces” radically different from the mimetic capacities of film, photography, and television... Computer-aided design, synthetic holography, flight simulators, computer animation, virtual environment helmets, are only a few of the techniques that are relocating vision to a plane severed from a human observer.” (42) This prediction is predicated upon an analysis of both a non-linear and linear trans-historical journey of ever more refined technologies in the context of a mutating observer. (43) Non-linear in the sense that the development of these technologies is a history of stops and starts and of erasures and refinements. “ At each level different non-linear dynamics take place, with their own multiple equilibriums and bifurcations between alternative stable states.” (44) It is a history that in its becoming is the result of a multiplicity of histories, cultural, psychological, aesthetic, biologic that develop tangentially and in parallel and are later implicitly conjoined. Much like non-narrative avant-garde film that history is a collage of and fitting together of disparate images and events that together define the character of that historical being. What we know as linear history is the result of an editing process that comes after the fact in an attempt to create a unified narrative and as a result a unified audience of observers who see and appreciate the same thing. As we will begin to appreciate as this essay unfolds it is the power of this narrative cinematic experience especially its affect on phyletic and episodic memory as it creates a unified audience of observers at the most basic level of the neural network. That in fact the mutations in built space that were alluded to in the first quote of this text by Jamison are in fact going on all the time. What Jamison is saying is that sometimes the changes in space and the objects that inhabit that space are ahead of the body’s ability to change in relation to them. For the spaces created by one generation of artists architects, city planners and fashion designers must many times await the transformed neurobiologic substrate of the next generation of observers in order to appreciate them. In the present situation the modernist object, space and sense of time have sculpted, through the process of neuroselectionism we spoke of earlier, the neurosynaptic structure of the modernist observer. Post-modern objects, space and time have not yet conspired to construct a population of observers who have the neurobiologic apparatus to understand them.

Any population is made up of a heterogeneous mixture of observers defined by the degree to which their neurobiologic architecture has been configured by specific cultural models instantiated in specific object time/space relations that are constantly shifting. Jamison’s model

of the technologic sublime can be somewhat reconfigured using this model. For here what is sublime is defined by what is beyond the brain's ability to understand and configure not because it is enormous, or huge, or scary and not because we can not imagine the interior mechanism of its working but because the configuration of neural networks has been sewn together by another set of cultural circumstances which have configured the objects and spaces of what we all consider is the real world. The neurobiologic sublime is then defined as those object, object and space/time relations that are beyond the brain's ability to understand and appreciate and in the presence of which we are helpless. Jamison's post-modern object or space/time relations is thus sublime when a specific modernist subject observes it. Gilles Deleuze expresses it differently as this quote from Gregory Flaxman's book *The Brain is the Screen* points out. "Deleuze often refers to Spinoza's remarkable claim that we do not know what a body can do and it is precisely in this context that we can understand this sense of the unexplored potential, for the brain and body have been reduced to a neuro-network deflecting images from perceptions into actions, a regulated system of feedback that Bergson calls "sensory motor schema such as the rudiments of a dogmatic image of thought Deleuze identifies with Hollywood Cinema.(45) These thoughts are very significant in relation to "Blow Up" because on one hand they allude to a system of imaginary relations that create an imaginary or cinematic neurobiologic substrate and on the other hand they help us diagnose the modern schizophrenic observer. An observer who is the result of the mismatch of two independent long term memory systems which randomly substitute for the other and in the process disrupt perception. Whether we look at Thomas who disappears at the end of "Blow Up or Robert Michel in Julio Cortazar's "Las babas del diablo", who looks at the sky though the image of a rectangle tacked to his ceiling, we are witnessing the effect of the fracture between these two non-congruent systems of memory and as a consequence the systems of representation they have coded for. The how and why of this process of mental destabilization is one of the subtexts of this essay and I think has something to do with the evolution of the construction of the perfect ergonomic object. When I say object I am talking about two parallel discourses that have evolved in tandem. On one hand the material object that has weight, perpetrates a force, can be authenticated by all the senses together, it can be touched, seen, tasted, heard and positioned according to the axis of the body. A camera would fit this description. On the other hand the image as it has evolved from the painting, lithography, photography, film and now virtual reality. For the purposes of this essay I would like to confine myself to that of the image and that of cinema most particularly. Cinema seen in this context becomes a stage in the process of the construction of the perfect ergonomic object. But what makes cinema so intriguing is that if we follow its genesis we must admit that one of the most important factors in this genealogy is how film deals with space and time. It is these new constructs of time and space that allow for a multiplicity of rearrangements of the real/virtual interface especially in fields like architecture, fashion, design, and art as well as city planning, social praxis, scientific research and political entanglements. Thus it is the experiments in time and space within the cinematic field that become folded and deranged as they are appropriated by other discourses that open up new possibilities and alignments for the information in those fields. New connections are built through the new possibilities of continuity. Thus a reverberation is felt along the entire network of disciplines that make up the plane of knowledge as the time/ space waveform travels throughout its volume.

Defining cinematic time and space

Deleuze divides cinematic history between two poles that are defined by classic cinema at one extreme and modern cinema at the other. What differentiates these two is how they deal with space and time not in the real world but as mental processes. How they in fact are linked to cognitive processes of the brain. Classic cinema is narrative cinema or the action film that has made Hollywood famous. As its description implies it is about a story. It is a sequence of events

that are linked together with a beginning middle and end. An appreciating audience follows the lineage of these framed events together as one mass being. For Deleuze what defines the narrative or classic cinema is its relation to what he calls the sensory-motor loop. He proposes that every sensation is followed by a response or action. Visual perception is linked to muscular contractions and this is the quality of the movement image a term he borrows from Bergson, who he says never appreciated the time-image, his later designation, because the technology to make these kinds of films was not yet in existence. Deleuze defines the chronological demarcation line where there is a disruption in the chronology of the history of film as 1945 with Visconti's film "Obsession". (46) This work of art would change film forever. As a result of the destruction of the social and cultural fabric of Europe due to World War 2 a new kind of film came into being most characteristically defined by Italian Neo-Realism but later followed by the French Nouvelle Vague and to which avant-garde cinematic practice of the sixties was closely linked. In describing De Sica's "Umberto D" he says "We run in fact into the principle of indeterminability, of indiscernability: we no longer know what is imaginary or real, physical or mental, in the situation, not because they are confused, but because we do not have to know and there is no longer even a place from which to ask. It is as if the real and the imaginary were running after each other, around a point of indiscernability" (47) Inherent in this description is one of the hallmarks of Deleuze's description of modern cinema the interpenetration of the objective and the subjective to the denunciation and simultaneous reification of both in the creation of the purely imaginary. There is an indiscernible blending and this seamless dissolution is the result of what he characterizes as the breakdown of the sensory-motor schema and the creation of the time-image in modern cinema. Time images which activate modernist cinema are differentiated from movement image which are the hallmark of classic cinema by their disconnection of time from space. Time becomes independent of space because the temporal continuity of the reaction time of the body as it responds to a stimulus in the sensory-motor schema is broken. When time and space are split off from the normal linkages that connect events time and space are reconfigured under the abstract notion of "any-space-whatever." Sonsigns and opsigns are the neologicistic inventions he creates to delineate these differences. Both are the result of the creation of a meta cinema and a meta language with which to read and understand it. Sonsigns are pure aural sensations untethered to the physical body as are opsigns their visual counterpart. Images freed from the body can dance and wander no longer adhering to tonal rhythms "spectacular moments give way to the most banal ones without a sense of rational logic.In the end the cinema trips into an ambiguity so overwhelming that the imaginary and real become indiscernible." (48) What in the end distinguishes modern and classical cinema concerns the way modern cinema disconnects one from external physical reality and attempts to bridge the gap thereby created on a different level. "The real difference between classical and modern cinema is not that the latter lacks any global integrity. Rather, in classical cinema the gap is filled in by physical action within a plot, whereas in modern cinema it is filled in by different mental operations, which require the spectator's active intellectual participation." (49) One more point needs to be clarified concerning Deleuze and film which will be helpful in our later analysis of Blow-up. Deleuze makes another distinction in his taxonomy of film history as he takes his idea of modern and classic cinema one step further and distinguishes between organic and crystalline cinema. He builds this other level of distinction through his idea of a crystal image of which opsigns are slivers. A crystal image is the point of indiscernability when there is a "coalescence of the actual image and the virtual image, the image with two sides, actual and virtual at the same time." (50) The crystalline regime is made up of these kinds of images and is distinguished from its ontologic counterpart called organic cinema, from which it emerges in three ways. First crystalline regime evokes images as descriptions without their normal linkages to a motor event that would usually follow. Second the crystalline regime confounds the relation between the real and the imaginary and instead invokes the terms actual and virtual. Finally it develops narration out of anomalies, irregularities, and false continuity rather than the field of forces, oppositions and tensions that normally characterize the organic regime.

But these new definitions of time and space that were invented through cinema were not developed in a vacuum, as they were influenced in changes in the appreciation of time and space that were occurring concurrently in the fields of physics, mathematics, psychoanalysis and literature just to name a few. What is more cinematic ideas of time and space spilled over and leaked on to other related aesthetic discourses such as fashion, design, advertising, architecture, painting, sculpture, performance and theater. In the end the changes that we have just seen occurring in the cinematic field in the evolution from classic cinema to modern cinema are reverberating in these other fields as well. Take for instance the Le Corbusier's, "La Fenetre de Longuer" the horizontal window that he fashioned after the camera shutter inspired by Dziga Vertov's Kino Eye. Here the traditional vertical window of classic architecture is exchanged for a slice of a horizontal picture framing. No longer constrained by the linear sense of time in which the body stands like a monad to view the sky, the horizon and the earth the horizontal window a fractured almost digital experience where the viewer can walk back and forth in front of its aperture in order to experience an "anyplace any where" in "anytime". As more of these cinematic time/places populate the visual field they will come to impact more and more the cognating population of viewers. Could the distraction that Vidler talks about in his Warped Space be in fact the result of a rearrangement of the pattern of neural networks in the brain corrupted, so to speak, by these temporal spatial relations. Could a conflict occur in the brain between two kinds of spatial and temporal neurobiologic configurations which disrupt attention leading to such conditions as Attention Deficit Disorder and Alzheimer's Disease. Is Thomas's condition, if I may call it that, one of temporal/spatial agnosia leading to a diagnosis mistakenly labeled as Schizophrenia. Or are we in fact prisoners of a process that in the end will give us superior intellect and allow us to multitask with great proficiency and remember things using superior strategies but for the moment makes us seem incompetent. This would seem somewhat at odds to my earlier discussion of cognitive and visual ergonomics. However understood as a process what one uncovers is that the progression towards the perfect object is a path not easily navigated.

The Conspecific Visual Niche

We share nature with all kinds of species. We know from ecology that each species survives because they have adapted themselves to a specific niche which decreases their competition for food and habitat with other species. Each niche is also made up of a set of visual signifiers, as well as auditory, olfactory and somaesthetic ones. I would like to limit my discussion here to those visual cues as it simplifies the argument and is more relevant to the visual arts which is the thesis of this essay. Each species niche is defined by a system of visual cues. For instance the cardinal's beak is shaped to crack open a certain size and textured seed which it can then eat. When building a nest it looks for certain types of materials and a specific habitat in which to build it. It uses visual cues when protecting its habitat and when looking for a mate. All together this assembly of visual information creates a visual map of the world for the cardinal. More importantly those visual cues are imbedded in the construction of the cardinal's ecological niche, a conspecific ecological niche because it is shared by all cardinals, and creates what I would like to refer as a "conspecific visual niche". This conspecific visual niche is the assemblage or web of visual signifiers that make up the cardinal's visual universe and are an essential feature of his adaptation. Nature is made up of many species each with their own conspecific visual niches. Man is one of them and in a remote time his conspecific visual niche was woven into the great picture of nature. Nature is thus a tapestry of visual niches of which the domain of the human being is simply one of many circumscribed entities. Of course there are visual cues that are not uniquely conspecific and are shared by more than one species. For instance man can eat seeds and fruit that are eaten by other species. Many things can be shared because they possess multiple levels of meaning such as a flower, which is pollen to a bee is a beautiful and romantic thing for a human. Human beings have created

and adapted to a “stratigraphic hierarchy” of visual relations which we are calling naturescape, urbanscape, mediascape, and cyberscape. As their names imply each refer to a specific set of signifiers. Naturescape as the name implies is the all the visual signifiers that are naturally occurring to which man must adapt. Urbanscape refers to the set of circumstances that are organized around the city that accommodate a population of individuals living and working together their roads, buildings and sewer systems. Mediascape refers to network of signifiers produced by society which are communicated through cinema, television and advertising. Cyberscape is defined as a whole host of informational technologies of which the world wide web is one. As we move from naturescape to urbanscape to mediascape to cyberscape what we see is the construction of a more rarefied and refined conspecific human visual niche. We share nature with the animal kingdom but very few animals including the smartest primates can surf the internet. Pigeons can adapt themselves to a building but unless they are specifically trained they have difficulty avoiding large glass windows. And this brings up another interesting fact. That as we move up along this axis of this ever more refined system of relations towards specifically human information systems we also find that vision becomes woven into a set of technologies that extend these perceptual capabilities while at the same time further refining their information content.. For example the differences seen between the seventeenth-century observer and a twentieth-century are the resultant of this process. The ontogeny of technological apparatus and its assemblage into systems of visibility, how they are linked to neuroperceptual processes, marks the maturation of a system of visual relations that defines an “ever more” refined conspecific visual landscape; one that is contrived and constructed for the idiosyncrasies of the human visual apparatus and that has been invented with the human visual processing apparatus in mind. These technological devices, invented in the scientific laboratory and originally limited to the context of parlor games, mapped out a seductive visual space that hailed and roused a waiting nervous system. “Although ‘set to work’ may sound inappropriate in a discussion of optical devices, the apparently passive observer of the stereoscope and phenakistiscope, by virtue of specific physiological capacities, was in fact made into a producer of forms of verisimilitude. And what the observer produced again and again, was the effortless transformation of the dreary parallel images is far less important than the inexhaustible routine of moving from one card to the next and producing the same effect, repeatedly, mechanically. And each time, the mass-produced and monotonous cards are transubstantiated into a compulsory and seductive vision of the “real.” (52) The artificially induced seductivity of the stereoscope which Crary suggests is similar to a Riemann space would later be conflated and enlarged in cinema as the sole observer was replaced by an audience and signifiers became supersignifiers. As audiences became used to the cinematic experience and acclimated, as a result of suspended belief, to the idea of substituting the real with the imaginary, the distinctions that separated the two also began to fade. This is the point where we meet Thomas. A product of the construction of a twentieth century observer, he can no longer discern the real and the imaginary which leads to what Roger Callois has termed “legendary psychasthenia.” (53) In this context, this term references Thomas’s elision not with nature, but with the mediated context of supersignifiers that is compounded by his job as a photographer and his close relation to the product of his labor, the photograph. He has two disjointed forms of memory, one that is a function of his real life experiences, and the other that the physical archive based on his own production of photographic images. “Blow up” is about the process of Thomas’s disconnection from reality and his own body as the vividness of the seductive landscape of the “constructed imaginary” is preferred over the real.

Avant-Garde Cinema as a self-reflexive exposure of self

“The often unacknowledged aspiration of the American avant-garde film has been the cinematic reproduction of the human mind.” (54)

Avant-garde film, as a reaction to narrative film, is usually based upon strategies of

interpretation and the unpacking of meaning. Narrative film, with its discourse linked to the spectators' perceptual and cognitive inclinations and habits, is the one most often adopted by Hollywood and is closely aligned to Deleuze's category of classic film (55) Avant-garde film has instead linked itself to what Stan Brakhage calls "a naive vision," one that is outside the code-based models of understanding adopted by narrative film where meaning is constructed and inferred from a display of random and novel visual stimuli and as such is closely linked with Deleuze's category of modern cinema(56). Narrative film is made of a series of images that are linked by certain culturally non-specific viewing conventions and techniques, such as shot-reverse shot, fades and bleeds, which remain hidden in the body of the film. Avant-garde film, on the other hand, investigates and displays the nature of the process of production in order to expose the film as a film rather than reality. We see the scratches in the film surface and unedited, raw footage. We meet the sound engineer and interview the director, thus demystifying the process of cinematic creation. We see the cuts and edits as abrupt changes of vision and scene. We see remnants of avant-garde cinema today in the work of Dogma who use little or non-studio lighting and use video cameras of poor quality in which we can see the grain of the film. Recently Memento a film about the loss of short-term memory used the editing technique itself to express and define what it was like to experience memory loss. Again we are reminded of Deleuze who suggests that the self-reflexive film is an important quality of what he calls the "Crystalline Schema". The audience experienced an analogous process as the sequence of cuts and visual jumps allowed them to feel as if they to were part of that experience. It is precisely through this process of the deconstruction of narrative conceits that the nature of cinematic experience shifts away from the director/creator and towards a cinema of audience. It is in the cinema of audience that we can fully understand avant-garde cinema and the cognitive praxis that identifies it. This argument is strangely reminiscent of the post-structuralist argument of the nature of the experience of cinema in which the screen is acting somewhat analogously to a Lacanian mirror.(57) Each viewer brings to the theater a different set of culturally informed values through which to monitor this visual experience. No longer bound by a constricted narrative with a finite meaning in a finite context, avant-garde cinema allows for a differential scanning of the filmic sensations, such that each viewer constructs an idiosyncratic meaning from a unique disparate set of stimuli emanating from the screen. Fred Camper, in "The End to Avant-Garde Film," states it succinctly. "Avant-garde film addresses each viewer as a unique individual, speaks to him in isolation from the crowd, invites him to perceive the film according to his own particular experience and perception, to see it differently from the way the viewer seated next to him would." (58) But the extent of this difference and individuality is limited to a certain context, a certain transhistorical discourse which has been built around avant-garde cinema. For the semiologic discourse of avant-garde cinema is not arbitrary. Rather, a cult of signification has been created in a radical context within the confines of an assortment of aesthetic signifiers. Avant-garde cinema developed with the micro-cultural context of Minimalism. "In fact, we can think of Structural film as the avant-garde's minimal strain of film making, equivalent to minimalism in painting and sculpture. And viewers who are familiar with the concerns of the visual arts during this period can make sense of minimal films like Eureka with strategies similar to those viewers use to make sense of minimal art."(59) The signifiers of avant-garde cinema are part of a network of signifiers and their aesthetic relations are bound together by, in this case, a Structuralist/Minimalist field. But the importance of avant-garde cinema as a model for cognition goes further than simply an edifice with which to define individual creativity and construct subjectivity. As we saw with our example of Memento it can in fact represent cognition itself. This is important of "Blow Up" which although having some characteristics of narrative film is a non-narrative one as well. Avant-garde cinema with its techniques of flashback, multiple and parallel complex narrative structure and close-up mimic many strategies used by the mind and the brain. In fact the minds ability to use remembering in telling a story, to focus on one cello player in a symphonic orchestral performance and to concentrate on one individual in a crowd are closer to techniques one finds in avant-garde cinema and non-narrative especially as

it grew out of sixties cinema. Avant-garde cinema's expansion into cybernetic sculpture, Les Levine's, "Contact: A Cybernetic Sculpture", Frank Gillette "Wipe Cycle", kinetic light images such as Jackie Cassen and Rudi Stern's "Circles" and multimedia-projection pieces like those of Stan VanDerBeeks attest to this radical position of interacting directly with the brain. "Blow Up" use of flashback is in the form of the flash-return in which Thomas returns over and over to the same place in the real to revisit the events of his initial experience in his memory. These self-reflexive paradigms realized here in cinema like flash back, montage and telescoping find their analogous structures in the cultural backdrop in general and in architecture specifically for instance in the transparent architecture of John Haydek. As such they create strategies that become imbedded in inscribed structures and cognitive strategies of information flow in the brain like feedback and feedforward neural networks, parallel processing and remapping to be discussed shortly. Thomas use of the magnifying glass to inspect the photographs and his use of the camera and enlarging device to investigate his own photographs is a metaphor for "Blow Up" as cinema in investigating the nature of the new observer of cinematic experience and memory. In this way this film is truly avant-garde.

Aesthetics and the visual landscape

The visual landscape is an historical stage in which objects and their ideological counterparts are arranged. Aesthetics has two "modus operandi." Firstly, it constructs what is outside the brain into packages of information that can be understood rapidly and efficiently. It does so by creating and recreating networks which can be appreciated ensemble and whose assemblage is dictated by the proclivities of the neuro-biologic apparatus. That is to say that the connections between objects, their relations and the spaces they occupy are arranged spatially and temporally according to the prescribed architectonic arrangements of neural networks in the brain. The history of aesthetics is partly an unconscious dialogue between the evolving neuro-biologic structures and the mutating cultural/visual landscape. In this way aesthetics can be seen to be "ergonomically" activating. Aesthetics constructs and organizes the visual landscape according to prescribed rules that are tuned to specific abilities of the human nervous system, allowing it to respond with greater efficiency. As we have already seen the nervous system has been sculpted by certain political, historical, psychological and social relations that form homologous interdigitated ensembles of coherent meaning. Aesthetic production being as it is an output of that inscribed neurobiologic structure will reflect that condition. Thereafter that very production will provide the scaffolding for the next neural cultural inscription. Another reading of the history of art is its' long term effect of reordering objects, space and time according to the rules of visual and cognitive ergonomics; rules that define an ontogeny of interactions between the evolution of those objects and spaces and the evolution of the nervous system. Secondly, it creates variability in the visual landscape. New forms are constantly emerging as artists reconsider known forms in new contexts as well as creating new objects. As we will see later, this idea of a "variable discourse" is fundamental to the developing brain and forms one of the linkages to the reception of avant-garde cinema. The visual landscape especially as it becomes encoded into the cinematic field is the product of historical debates as to what deserves attention; culture and ideology can be critical. We have just emerged from a period in which ideology played a fundamental role in its construction and we have now entered into a time in which issues of gender and race are playing even greater roles in constituting what receives attention. Notice the plethora of shows in which artists from African, Asian and Middle Eastern countries are contributing. This is more than just a fad but is rather a result of the globalization of art and the desire to expand the vocabulary of the aesthetic formation away from its historical Western-European dogmatic past. It is through the historical discourse of aesthetics and its sub-discourses of architecture, urban planning, landscape architecture, advertising and media (including MTV) that culture and ideology affect the visual landscape.

Visual and Cognitive ergonomics

“Man sets up the world toward himself and delivers Nature over to himself.....Where nature is not satisfactory to man’s representation, he reframes or redispeses it. Man produces new things that are lacking to him.The Open becomes an object and is thus twisted around toward the human being.” (60)

“This initial paradox cannot but produce others. Visible and mobile my body is a thing among things; it is caught in the fabric of the world and its cohesion is that of a thing. But because it moves itself and sees, it holds things in a circle around itself. Things are an annex or prolongation of itself.” (61)

But what is cognitive or visual ergonomics? The word ergonomics comes from the Greek words *ergon*, to work, and *nomos*, pertaining to a set of laws. Ergonomics is concerned with designing the most efficient and physically effective interface between humans and their workstations. In creating an ergonomic design, the object, system, or environment should be designed according to the physical and mental characteristics of its human users. (62) In its early manifestations ergonomically astute designers limited themselves to the proportions of the musculoskeletal system. Designers have also realized the importance of crafting spaces that are ergonomically designed for the senses such as sound and sight. And recently cognitive ergonomics, which takes into account perceptual and cognitive strategies in the design of computer-worker interfaces, has come to be investigated. For the purposes of this discussion I would like to make the following distinctions. Although cognitive ergonomics evolved from visual ergonomics it is differentiated from it. Visual ergonomics is a term that defines a composite of strategies through which nature is represented in the non-plastic art and is reformed and organized according to implicit and explicit knowledge of neural processing whereas cognitive ergonomics relates to the way that artificial information is reconfigured for the process of cognition occurring in the brain. Because as we have seen previously persistent strategies of representation found in painting and drawing continue to be important in newer strategies such as photography, cinema and new media visual ergonomics continues to operate presently along side cognitive ergonomics many time serving as its foundation and at others serving as its schemata. Cognitive ergonomics is especially important in the creation of virtual reality programs as the need for information parsimony is the greatest. In the desire to create a sense of real space virtually with the extant technology now at hand it is more important than ever to know the specific proclivities of the nervous system so that programs can use the limited technology to the greatest effect conserving weight and space in these applications. As cinema exists midway between these newer applications and early aesthetic forms and only recently been joined to new media applications I would like to continue to use the term visual ergonomics in the following discussion keeping the above discussion in mind.

Networks and the Brain

Before going on with this explanation I think it is necessary to reveal some more contemporary issues of neuroscience. (I have been trying to expose the reader slowly to this material in specific contexts to maximize understanding)) An intricate web of genetically engineered, synchronous and diachronous events controls the in utero development of the fetal brain. Through DNA instructed timed encoded directives (the process of heterochrony) neural development proceeds in an orderly fashion resulting in what is referred to as the primary repertoire, a degenerative and variable nervous system at birth. (63) ‘Degenerative’ in this context means that there is a vast and varied population of nervous cells (neurons) with a multiplicity of possible ranges for stimulation. This has two major consequences; more then one combination of neuronal groups or networks can lead to an specific output and a single group can participate in more than one kind of signal functioning. “ a conceptual network (a

neural network coding for an abstract thought) would be a large network involving broad areas of unimodal and polymodal association cortex. Because it would include many parts of many networks with common connections it would be not only by widely connected but also robust.” (64) Variable refers to the fact that this genetically proscribed nervous system is the result of a genetic assembly of structural components which themselves are the result of selective changes occurring over the history of that species. “Evolution suggests that these sense organs specify internal states that reflect past experiences of our ancestral history. Once we are born these ancestral circuits (comprising the inherited functional architecture of the brain, are further enriched by our experience as individuals.” (65). That genetic code and the primary repertoire it has designed contains many vestigial remnants of evolutionary experimentation that are no longer significant for the modern human. Thus neurons that code for a prehensile tail used by our primate ancestors is no longer relevant to the life of a modern human. We no longer hang or swing from branches in the trees. Yet at birth neurons that could code for the perceptual and motor perceptions that are connected to the tail hypothetically could be present. A variable nervous system is primed to adapt to any number of environmental conditions that it could hypothetically confront within certain limits. Those limitations are the result of two kinds of developments. On the one hand there are limits of the neurophysiologic and neuroanatomic systems themselves. Sensory systems for instance are limited as to what they can respond to. On the other side of the equation there are limitations as to what is possible to be created given the possible technologies available. The history of early man is a testament to this fact. The level of sophistication in tool making limited the kind of stone tools that could be constructed with a kind of revolution taking place between 0.3 and 0.12 myr BP when they learned to obtain a flakes of flint from designated cores of stone called the Levallois Technique. (66) The fact, for instance, that the appearance of objects have evolved over time and that cities look different because the architectural styles of the buildings have changed does not mean that we will not recognize them. Of course we know that we do. Perhaps as we have already discussed our perceptions of the same object may change with time but in general we recognize a fork as a fork. I think that this fact has important implications on how the brain is set up.

As was noted before the visual cortex is divided up into regions which code for specific kinds of information like color, form and movement. Vision requires first a parcellization of visual information and the distribution of these individual qualities to their respective areas for analysis before they are undergo another level of divergence to association areas for further analysis before undergoing binding. For instance spatial coding is done in the parietal lobe especially area PG whereas object recognition accomplished down stream in the temporal cortex including prestriate and inferior temporal areas. The implication of this fact is that all objects whether real or imaginary are first broken down into fragments before they are reconstituted. This fragmentation has implications for how the objects are reconstituted and the possibility that the fragments themselves can develop their own relations such is the case with the fetish. Although the appearance of objects in their full and whole form display much variation when they are broken down into fragments, especially at a size below the visual systems ability to make fine discriminations at the level of form, movement and color much of this variation dissipates. In addition their reformulation into perceived whole forms becomes more an issue of temporal codes that connect dissimilar forms and disparate areas of the brain together. “In other words the making of images is a spatially parcellated process. But since our experiences appear integrated to our mind rather than parcellated, we must consider how integration occurs. Our idea is that timing, that is, synchronization of separate activities, plays an essential role in integration.” (67)

Like the memories in the brain cultured memory system is a recatagorical system. New configurations are bound to preexisting forms or inform preexisting groups of forms and are negotiated through these historical forms just as new memories are compared to long-term memory in perception. A variable nervous system has much flexibility and plasticity which

allows it to mold itself through the manipulation of populations of cells, different distributions of inputs and outputs can result through the synchronous firings of differing populations of cells, to changing environmental contingencies. This primary repertoire is primed to receive information from most environments. Neurons and networks form a vast array of spatial connections. But even though the brain has a vast amount of potential at this point it must await directives in the form of organized perceptions to actualize its potential. The helplessness of the newborn attests to this. Notice I used the word organized sensation. The world is a vast array of organized information; a huge repository of inscribed cultural memory that sculpts the primary repertoire into the secondary repertoire. That array is more than spatial it is temporal as well. As we will see explicit and implicit temporal relations exist in the configuration of real and imaginary objects and to the real and virtual spaces they inhabit. The environment that the brain encounters sculpts the brain according to the brain's inherent susceptibilities of stimulation. We know about the eye's ability to perceive the visual spectrum but not ultraviolet radiation. At higher levels of cognitive function and at more abstract layers of information the brain also experiences certain constraints. Our previous example of the sublime object of regard such as Marcel Duchamp, R. Mutt seen by viewers in the early nineteenth century might be an example of the limitations of the brain in reference to abstract thinking. Although these higher functions of abstract thinking develop later, think for a moment of the late arrival of language learning in the infant and are in fact the consequence of the developing organisms relation with to the environment it is the micro-architectonic structure of the primary repertoire that allow the brain to have a degree of informational susceptibility. (68) This occurs as a result of a process termed selectivity and "selection occurs among populations of synapses, strengthening some synapses and weakening others, a process which leads to the formation of the secondary repertoire. The ultimate consequence being that certain circuits and neuronal groups in such repertoires are more likely to be favored over others in future encounters with signals of similar types." (69) The outside world presents vast arrays of variability to the developing child. Cultural discourse is involved in a complex feedback and feed-forward looping system with specific political, social, political and technologic relations that transform it and the same time are changed by its transformed meaning. For just like in the brain different relations that form networks contribute different levels of energy to it depending on the specific context they are operating in. At certain times different cues are earmarked as important and others unimportant. Those assigned as important are repeated and appear over and over again and become involved with other systems of networks that share common heritages or meaning. As a result these "degenerate stimuli" form nodes in a complex array of meaning systems. This has some implications for the brain that builds its networks through a process of neuronal group selection. First neural networks stimulated over and over again by these specific repeating stimuli undergoes transformation through a redistribution of their synaptic weights and begin to operate faster and more efficiently. Secondly the repetition itself becomes folded into other repetitions of other networks where they share a common stimuli or context in which they are displayed. Thirdly they are woven into a tapestry of historical and genealogic unconscious and implicit relations that create cultural memory. Finally these networks attract other immature neurons, called pluri-potential neurons that are transformed in the context of this information and take part in the network. This helps explain the brain's exuberant growth during early development. This process is similar to the activation of the beta lymphocyte by antigenic influences. As a result the network becomes larger and more complex. On the other hand those networks that are not repeatedly stimulated do not attain a level of efficient firing to allow them to compete with those neurons that are repeatedly stimulated and tend to be crowded out and undergo a process referred to as cell death or apoptosis. "One particularly interesting aspect of neural development is that the brain overproduces neurons, possibly by a factor of two, and the extra cells are lost by a process of cell death. Similarly, a large proportion of the cortical synapses are lost during development perhaps as many as 50 percent." (70) The color category red may stimulate neurons sensitive to this particular wavelength. Even though on some rare occasions individual neurons could serve as units of selection, in actual fact

groups of neurons provide the sufficient basis for mapping. The repetitive nature of red things in the environment stimulates those neuron groups repetitively. Repetitive stimulation leads to greater efficiency in the neuronal groups facilitating action potentials and later aiding in the release of synaptic chemical messengers which transmit the information to the next neuron. The color red colors things: things that have shape, that move, and which have texture. Notice that we don't see things but categories of things. The real is parceled into bites of different categories to which a pre-programmed brain (gross functionality) is tuned. Some of these relations occur synchronously over and over again. Consequently, groups of neurons in the visual part of the brain known as the visual cortex are repetitively stimulated together. In this case, neural networks are called local maps because these neurons are tethered together in the local area of the visual cortex.

The construction of local mapping conforms to what occurs in a general way on the outside. I say in general way because what is coded is in fact is only the salient features of the external world. "The correspondence between the structure of the neural activity pattern in early sensory cortices and the structure of the stimulus that evoked the pattern can be quite striking." (71) The color red and its associated object relations like movement and shape are linked to other sensations as well, such as taste and smell. The resulting maps are projected upon one another through a process called reentry. Interneurons tune groups of specified neurons synchronously through such methods as oscillatory potentials of 40 HZ. "One possible solution to this conjunctural problem is to superimpose a temporal dimension to the spatially segregated, but anatomically connected, functional events in the thalamocortical system. The addition of a temporal component to the topographic representations of the sensory areas could sustain an indefinitely large number of representations." (72) The mapping becomes truly global when desire and other emotions are linked into the map(s) through the hypothalamus and followed by thalamocortical outputs to the precentral gyrus leading to action. What is crucial is that the rules that determine connections between individual neurons goes for networks and maps as well.. Amplified maps develop efficient connection between their constituent neurons and this in turn gives them an advantage when competing for information with other networks. Poorly amplified maps cannot compete as effectively and in the struggle for neural space find themselves at a disadvantage. This becomes important when one considers the relationship between organic/real stimuli and those that are artificial and phatic. Doesn't it make sense that these phatic stimuli as they are engineered to capture attention, are mechanically reproduced throughout the visual landscape and within the context of modern society have been ordained as of crucial importance would create and amplify neural maps more efficiently and in the end would dominate the neural space of memory in the brain. That as these phatic signifiers form networks with other phatic signifiers to produce super networks... The question then becomes, "What about the other side of this equation?" Just like the thalamus of the midbrain sends inputs to the cerebral cortex, the cerebral cortex in turn sends back messages to it. Are the inputs from the environment which sculpt the brain followed by outputs from the brain that sculpt the environment in ways that are determined by a set of a highly determined strategies used by neuronal networks? Does the brain change the environment to produce a kind of environmental memory that will create contingencies that will activate neuronal networks more efficiently? Is a visual landscape full of phatic signifiers a kind of historical map that denotes a series of interactions between visually significant ergonomically efficient sensory packets and the developing brain? Is the process of neural selection sped up as a result of this system of culturally derived remnants interacting with successive generations of unformed neural tissues? The construction of the new observer, in this case of Thomas, is the result of technological, sociological and cultural vectors that modify the inhabited conspecific visual landscape and recursively feedbacks upon the brain. The radical shift in the visual landscape of modernism delineates a radical shift in which the observer "increasingly had to function within the disjunct and defamiliarized urban spaces, the perceptual and temporal dislocations of railroad travel, telegraphy, industrial production

and flows of typographic and visual information.” (73) This quote served as an explanation for the psychological consequences of the reformulation of the city at the end of the nineteenth century which heralded Modernism but the same could be said for the radical changes we see today as a consequence of new technology. These radical shifts in temporal and spatial coordinates create changes well beyond superficial appearance. They imbed new temporal and spatial machines into the cultural and visual landscape. They are added to a succession of such temporal and spatial remnants left over from past experimentations creating new foldings of time and space; many times making the systems that they came into contact with more efficient. As such they become the backdrop upon which objects and their relations are perceived and cognated. To continue with the argument of this text they have consequences for the developing brain by creating new patterns and connections at the neural synaptic level. This in the end could have two hypothetical effects. On the one hand it could create a mind which could learn information more quickly. What ever its cause children’s ability to operate computers and understand computer logic usually outdistances their parents. Is this because of early experience and practice or is the logic of the way a computer is set up more in tune with the more contemporary brain and mind? On the other hand it has created an observer subject to distraction, displacement and disjunction.

Perceptual and Motor Memory: The Perception-Action Cycle

There are so many definitions of memory that any one definition is bound to be deficient. This very fact is in itself a proof that we can only guess at what it is. However if I am to continue my exploration of the twentieth century observer I must first come up with a reasonable definition and then proceed with analysis of the way the very territory of memory is the site where transformation of the observer takes place. For the first part of my analysis I would like to rely on some of the definitions and research of Joaquin M. Fuster in his book *Memory in the Cerebral Cortex*. (74) On pages seven and eight of this essay I introduced under the heading the “Taxonomy of photo-cinematic memory” the terms phyletic and episodic types of memory to refer to different types of artificially produced images. I would like to again delineate these types of memory under the rubric of phyletic and individual memory. (75) As stated before phyletic memory is the state of neural network configuration at birth and as such represents the endpoint of a multitude of evolutionary experiments which directly affect the genetic code. This phyletic memory allows the brain to distinguish the elementary sensory features of the world that, as we will see later, are essential for the construction of the multitude of neural networks essential for individual memory. But there is a motor phyletic memory as well. Just as the animal is able to sense elementary features of the environment it is also able to perform a variety of motor behaviors that may be complex though stereotypical. This phyletic memory is similar to what we called the primary repertoire. Through a process of neural selectionism, based on a model first introduced by Hebb, synchronous converging stimuli alter membrane potentials of neurons and groups of neurons allowing them to fire together with greater ease thus creating connections between them. Neurons that fire together wire together. Some of these connections will be purely spatial but others will be temporal and consist of recurrent and reentrant circuits. Certain groups not so stimulated will undergo apoptosis or cell death. In the end a secondary repertoire will be formed consisting of these neurons and their cell assemblies that best resemble those stimuli that are most recurring in the world that they are born into.

What is important for us here is that through this process of neuronal group selection, or some analogous system, the sensory and motor systems of the brain, which in their early stages of development were primitive and fairly distinct, become linked up as a contiguous system of inputs and outputs, convergent and divergent information bundles, called the perception-action cycle. This cycle is made up of two systems which are in constant communication with each other and are identified by well established cortical substrates although for motor memory

the situation is somewhat more complex. The evidence for localization of perceptual memory in the posterior part of the brain including the occipital, parietal and temporal regions is well established. From a neurophysiologic point of view, where functions are stressed above strict anatomical demarcation, these areas are referred to as the primary sensory cortex, the peristriatal association areas and the distant posterior association areas in which multimodal sensations are combined. On the motor side the situation is more complex. First of all motor memories are inextricably bound to such things as kinesthetic sensations. Secondly the source of any action is not linked to a specific stimuli, except in the limited case of a reflex arc, and is instead emanates from a very abstract set of conditions. Thirdly motor actions are not as well localized as purely perceptual phenomena and are the concerted result of other stimulus like that coming from the cerebellum that modifies the outgoing impulses. Having said this for the sake of this conversation I would like to limit our discussion of the seat of motricity to the frontal cortex specifically to the areas of the prefrontal cortex, the premotor cortex and primary cortex. These systems operate as large interconnected neural networks that are linked to each other. The prefrontal cortex represents almost one-third of the frontal cortex and is the last of the neocortical levels to reach maturity. It plays a role in the temporal organization of behavior. It has been called the organ of creativity because it is important in planning prospective, future actions. It is also important in short-term sensory memory because what we do in the future is so much based on what and how we did it in the past. "The two sets of prefrontal neurons and their respective networks would represent two mutually complementary and interactive representations-one retrospective, the short-term memory of the cue, and the other prospective, the short-term memory of the forthcoming response. The second would be what Ingvar has called a "memory of the future." (76) The premotor cortex is interposed between the prefrontal cortex and the primary motor cortex our next area of discussion. As such it acts as an intermediary in the discharge of motor set, the series of linked motor subprograms that together constitute an action. Premotor neurons encode motor acts rather than actual individual movements. They are interested, metaphorically speaking, in such things as the coordinates of space that the movement will take place in, the sequence of motor acts and finally the actual goal. The primary motor cortex, our last category, is no longer thought to be the defined by a set a genetically proscribed somatotopically organized cortex in which a specific area of the cortex controls a specific muscle group, Instead recent research has fostered the conclusion that instead there is tremendous functional overlap and distribution where somatotopy is defined by neuronal innervation of a group of synergic muscles. (77)

These different systems are all arranged together in an hierarchical arrangement. Perception begins in the primary cortices with the particulars of sensory analysis and continues into the peristriate and association areas following a gradient of ever more synthetic and abstract types of information processing while the motor hierarchy displays the opposite pattern beginning with the most abstract temporal based information in the prefrontal areas followed by the particulars of movement in the premotor area and finally resulting in the microgenesis of action in the motor cortices. Yet in spite of their arrangement the interaction of each subsystem to itself and to the larger system as a whole is far from linear and can in fact by overlapping, eccentric and bi-directional depending on synchronous and parallel processing strategies. (78)

Neural Networks and memory, building a global apparatus

"My basic claim is that a memory is a cortical network, an array of connective links formed by experience between neurons of the neocortex, and that the function of cortical neurons in memory derives exclusively from their being part of such networks...At all levels and for all kinds of networks, the information networks contain is defined by the structure of each network- that is, by its neuronal elements and the connections that link them." (78)

The visual apparatus, the eye, visual cortex and brain, are subject to the same connectionist model as the rest of the brain. One of the problems for this model is how a parceled input of the external reality is integrated into the seamless consciousness we appreciate. The brain is not instructed by specific objects in the environment nor do we hold on to the memories of every object and every possible orientation of those objects. Instead we remember categories of “characteristics” of objects such as colors, lines, corners, and movement. I have already explained how information from external reality is broken up into parcels of characteristics by the visual cortex and undergo various levels of integration as they are processed.(79) But these areas like V3, V4, and V5 are connected to each other through interneurons at all levels of the cortex. Through a process of reentry, the perception of the world is tethered together through a process called binding into the “seamlessness” of consciousness. Ernst Poppel divides binding into three categories. At the primary level of visual binding, spatial binding of identical features in different regions of the visual field occurs, and may be a prerequisite to establish contours and surfaces (topological primitives). The second kind of binding within a sensory modality deals with the binding of different qualities. This is linguistically based and presumably the system must determine which qualities are bound together. This second level of binding is dependent upon an a priori internal representation of the perceived object to which the perceived object is compared. The third level deals with the binding of information coming from different modalities which occur in the same scene. (80) Although different kinds of internalized temporal relations are hypothesized for each of these categories organized through reentry by certain kinds of oscillatory potentials and excitability cycles, another explanation may be found in the way the “real/virtual interface” is constructed to create “temporal dispositions” that favor different kinds of binding. I think Poppel’s description could be read in a different way. Space and time as it is imbedded and forms the real/virtual interface configure neural networks through the process of neuronal group selection during critical periods of development which facilitate binding strategies in the nervous system. In turn the nervous system then feeds back on the world further organizing the dispositions of objects and object relations through the use of aesthetic codes both in terms of their spatial and temporal relations. Art and artists as they mediate the aforementioned immaterial social, political, aesthetic, historic, psychological and economic relations in the form of architecture, painting, design and fashion are constantly experimenting with time and space. This experimentation can create new kinds of time and space relations some of which bind the fragments of the real/virtual interface in unique ways. Like evolution only certain of these experiments will persist. In this case those that have special spatial and temporal qualities that allow more efficient linkages between neurons or neural networks; those that make the nervous system more efficient and more complex. This double meaning is the essence of visual ergonomics. On one hand the system, meaning the brain and the world, develop conditions which facilitate the creation of network relations that make them fire more efficiently and thus increase their selectivity and on the other allow them to be connected to many levels of meaning both explicit and implicit. What this complexity means for the brain is that each neuronal networks will develop spatial and temporal configurations that allow them to interact with many more neural networks both locally and globally creating meta-networks. What this means for the world is that the objects, and their relations, which will be integrated into huge matrices of meaning through multiplexing and folding with other objects. That these new associations can through the process of neuronal group selection sculpt and facilitate the brains innate capabilities in some cases actually increases its potential for thinking and acting. Oscillatory potentials exist as implicit relations between objects in the world at their more abstract level. In our discussion of the role of the frontal lobe we saw that it is in the prefrontal cortex of the frontal lobe that abstract thinking and timing occur. These oscillatory potentials could be the product of linguistic or aesthetic codes. Language imposes meter, grammar and logic whereas aesthetics imposes formalistic and factographic structures upon the world we perceive.

When we look at the central nervous system we are impressed by its hierarchical and non-

hierarchical processing mechanisms. That is to say that when we look at the visual cortex and its surrounding association areas we are looking at the a system that goes from a concrete topographically mapped system to one which is abstract and non-topographic. I described just the opposite situation for the motor system as it goes the abstract to the particular. As Fuster states, “The networks of phyletic memory and the lowest and most primitive components of individual memory networks.can be viewed as topologic feature maps, in that their neurons encode sensory and motor feature. At higher levels of individual motor memory, however, the concept of feature becomes progressively more dependent on idiosyncratic connections and less on concrete physical parameters.” (81) Could really be constructed in a similar way with discrete layers of relations imbedded and subsumed into each other. We all know this is true as in the physical world there are concrete and abstract relations. Aesthetics is one means to form these abstract connections through the organization and linking together of raw sensations into images, figures, patterns and eventually into concrete lumps of signification. Aesthetic paradigms are reflected in the way the “real” looks and how the objects in the “real” are organized in the construction of the visual landscape. Each aesthetic paradigm organizes different sets of partial relations into wholes that appear stylistically different and are therefore recognizable as different. This is a kind of binding, similar to the one we spoke of already in the brain and it too creates a series of world pictures that get woven into each other. Could these two kinds of binding be working together to make the brain a more efficient machine? Have these two types of binding evolved together in tandem with strategies of aesthetic configuration organizing the world in ways that connect to possible neurobiological strategies either latent, part of phyletic memory, or manifest, the result of neuronal group selection and vice versa? In spite of all the artistic research done in the sixties and seventies on time space relations in art we still pay too much attention to spatial configurations when we talk about aesthetics and its determining factors. Objects and their relations have temporal signatures which are tethered to aesthetic temporal signatures that define for instance the different periods of art from say Romanticism through Impressionism through Constructivism through Surrealism through Abstract Expressionism through Pop Art and into Post-Modernism. Aesthetics configures implicit rules that tether different objects on a canvas through, for instance, viewing strategies and linguistic codes that act similarly to reentry in the brain allowing the fragments or images of the work to be appreciated together as one whole or differentially as a network of pulsating styles sometimes referred to as bricolage. I would like to call this process “matching reentry”. The brain therefore has specific cognitive strategies it uses based on its’ neuro-anatomic and neuro-physiologic possibilities that aesthetics as it constructs the world takes into account either by chance or explicit instructions. As the process is bi-directional aesthetics may then help configure the brain as it affects strategies of binding through temporal signatures.

Just as sight is restricted to certain specific wavelengths of the visible spectrum that are the result of the specific anatomic-physiologic proclivities of a rod-and-cone based retina, the brain also has certain predispositions and limitations due to its anatomic-physiologic characteristics. The primary repertoire and phyletic memory are the latest developmental stage of the metastable process of evolution. As such the spatial configuration of neurons across the cerebral cortex are fixed along prescribed horizontal and longitudinal axis. For the most part the human brain at this state is a huge feature detector awaiting directions from the world as to how to link these fragments into sensible wholes. (Of course this is different for different species in which for instance running at birth is essential for their survival) Temporality plays a role in this process as the primary repertoire matures into the secondary repertoire. However certain kinds of temporality may be more efficient than others in the transfer of information. There are limits to the temporal coding patterns in the central nervous system as certain frequencies are preferred over others. “These findings suggest that 40-HZ oscillatory activity is not only involved in primary sensory processing per se, but forms part of a time conjunction or binding property that amalgamates sensory events occurring in

perceptual time quanta into a single experience. Indeed 40 Hz oscillator activity is prevalent in the mammalian CNS, as seen at both single-cell and multicellular levels. This oscillatory activity... has been viewed as a possible mechanism for the conjunction of spatially distributed visual sensory activity or multiregional cortical binding.” (82) Could this suggest that certain external relations could be coded more efficiently if they came close to matching the brain’s inherent temporality? For instance those that are already prefigured to “link into” this 40 Hz oscillatory potential. Aesthetics that is ergonomically entrained may reflect these neural dispositions. Today aesthetics may in fact reflect a transhistorical discourse which concerns the construction of a visual landscape, real or imaginary, which is maximally organized to capture attention and transmit information from outside to inside the brain. One must not think this history a series of smooth transitions or a “smooth ride”. Aesthetic history is rather a series seizures and disruptions that manifest themselves as experimentations gone awry. Test tubes that blew up in the face of their practitioners. Holwegs, to use the German word for paths that lead to abrupt ends in the nowhere place of the forest, that left artists and their contemporaries unknown and destitute. But in the process these experiments left a residue that combined over time with already known established forms creating new ones that as a result of these new combinations were able to configure the nervous system in more complex and efficient ways. We have been calling these stimuli “visually or cognitive ergonomic”. Perhaps what Paul Virilio calls the phatic image, an image that makes you want to look at it, is related to this concept. That the abstract relations that signify high order cognitive function may in fact be the result of developmental processes which inscribes aesthetically contrived relations, as they exist in the world of objects as “reentrant configurations”, upon the brain. In this way the “reentrantly configured environment” would have to undergo little transformation from its abstract code in the world to its abstract perceptual code in the brain. It might also be hypothesized that certain constructions of the external world, or of the pictures that represent and mimic them are unconsciously built in ways to facilitate the occurrences of such temporal relations. In the evolution of aesthetic styles certain forms begin to replace others in the visual landscape and with time these forms recur over and over again. There is a competition between these styles and forms in real time and space with certain styles replacing others as the social, political, aesthetic, psychological and economic relations that helped form them create different pressures that allows one style to predominate over another. I am hypothesizing that these forms have both spatial and temporal components and as they replace already existing forms with new ones these spatial and temporal relations become preponderant. (Time and space then can be viewed like the history of optical machines as devices that render their abstract qualities in accordance with a mutating and transforming cultural context.) It is in fact the differences in the spatial and temporal components that makes them more “evolutionary fit”. (However must take this in the context of an homologous set of relations. Sets of relations that may like the subculture of the Beats or Rastafarian be antithetical to the existing predominant hegemony of forms.) Because one should not forget that the brain is changing to in ways that match those occurring in aesthetics because through the process of neuronal group selection aesthetics and its partner culture are sculpting the brain as well. These preponderant temporal and spatial patterns become more and more available to the developing brain and as such cause repetitive excitations in the networks that code for them.

Towards the beginning of this century cinema began to have a tremendous effect on how art was made. We already spoke of Marcel Duchamps’ *Nude Descending a Staircase* and the work of the futurists. But painting was not the only practice to be effected by film. Architecture would begin its long dialogue with it during that time as well. Beatrice Colomina’s comments on Le Corbusier’s windows are a pertinent here. “With Le Corbusier’s “fenetre en longuer” we are returned to Dziga Vertov, to an unfixed, never-reified image, to a sequence without direction, moving backward and forward according to the mechanism or the movement of the figure.” (83) Le Courbousier in his desire to make architecture that would reflect his time adopted cinema into his practice. In doing so he also imbedded temporal and spatial relations

that were invented by this new art form. In this case it was a time that no longer passed from past to future but in this case from future to past. The space of the traditional window that had been based on the vertical body viewing nature in one significant moment now became cut off in unpredictable ways and time began to become digitalized as the viewer could move forward or backward in front of it making the future past. The twentieth century has witnessed this imbedding of cinematic relations into architecture over and over again. As a result more and more of our visual space has been rendered cinematic. From the transparent buildings of the mid century, to the dynamic digital billboards that mesmerize us, to the digitally inspired works of the Guggenheim Museum in Bilbao architecture has acted as a mediator of cinematic apparatus and discourse reconfiguring the real worlds temporal and spatial relations into the real/virtual interface. Naturally these relations as they occur repetitively and are overwhelmingly dispersed throughout the world would have effects on the brain. Neural networks would be built and configured in line with this new landscape.

Aesthetics may also discover novel combinations of visual stimuli that elicit more efficient temporal reentrant firing and unleash nervous connections, held in check, which for instance could code for more complex types of information if given the correct algorithm with which to connect. Like hypertext, for instance, layers of information can be built upon each other through restructuring its codes in folded, multiplexed temporal and spatial relations. Architecture as well has its own history of such building of complexity and folding of its material foundation. “In Rebstock Eisenman starts to work instead with a type of complication that is no longer a matter of linear juxtaposition in an empty space or canvas but rather assumes the guise of a great transmorphogenic irruption in three-dimensional space. Thus the Idea of the project passes from a punctual dislocation of a Place to a multilinear smoothing out of a Site, and from notions of trace and archaeology to notions of envelopment and actuality...” (84) In a dynamic and constantly evolving nervous system mappings that results from these new collages of information and for which new forms of reentry and parallel processing would be necessary for their use might be favored. The transhistorical discourse of visuality would therefore be a history of an interchange between an evolving externalized reality, reflecting changes in the aesthetic discourse with changes in the nature of objects and their relations, and an evolving adapting nervous system which codes this new visuality in ever more efficient reentry-driven global neural maps. What I am saying is that temporality is ingrained in the processing of certain physical counterparts of nervous excitation. That objects and their relations and the context they exist in have certain kinds of excitability signatures that are reflected in specific kinds of neural temporality which act to link neural networks together. But one must also remember that these new combinations of spatiality and temporality may occur because of chance like a Surrealist poem that emerges out of automatic writing. That this random occurrence might lead to a novel combination of object and object relations which by chance might coded by a more ergonomic coding property. With a variable and plastic/mutable nervous system chance encounters can have lasting and positive effects.

Ergonomics, mimicry and memory

“I referred to synergies earlier, but consider this: if the target units controlled by the brain are collectives or synergies rather than the individual muscles themselves, the brain’s functional load underlying their control will be greatly reduced. The extent of this reduction will be proportional to the degree to which subsets of muscles are activated simultaneously in a given movement execution.” (85)

As I mentioned earlier cognitive ergonomics that takes into account perceptual and cognitive strategies in the design of computer-worker interfaces, has recently grown in importance as industry has digitalized their technologies. We also made the distinction between visual

and cognitive ergonomics and stated that visual ergonomics was a forerunner to cognitive ergonomics and was instrumental in transforming the real world through painting and sculpture and early on photography and cinema. We also mentioned that cognitive ergonomics had become more important for the development of cinema and new media. For the purpose of this essay I would like to stick to the more limited condition of cognitive ergonomics as it relates more directly to cinema. I would like to define cognitive ergonomics as a process through which objects and their relations as they exist in the real and now virtual world are organized according to evolving and mutating connections. These connections are spatial but they are temporal as well. In the end cognitive ergonomics has three levels of operation. First it captures the body's attention by creating powerful attractors which quickly bypass primary concrete processing and stimulates higher and more phylogenetically advanced areas of the nervous system like the forebrain. Second it organizes objects and their relations in such a way as to make their perception easier and faster for the nervous system. It organizes information according to the nervous systems own innate neurobiologic predispositions both in the spatial organization of its neural network configurations and in terms of its existent temporal strategies. Finally cognitive ergonomics, through its activities in the external world, through the process neuronal group selection is an important force in reconfiguring neural networks in ways that allow them to operate most efficiently. What this implies is a set of conditions organized in the real world that feedbacks on the developing nervous system to alter its' neural assemblages and just as importantly a now changed nervous system changing the world to conform to these changes. But we know the world is in constant flux as the throng of mutating, sociologic, psychological, economic, technologic and aesthetic relations, as a consequence of their summated potential, are radically altering the conditions in which objects, their relations and the spaces they occupy live. The fact that the brain has critical periods of development during which it has maximum flexibility or plasticity relegates the environments ability to change the brain to a specific time envelope to one generation at a time. Thus the changes its altered neurobiologic substrate can have on the environment are limited as well. Cognitive ergonomics is also important in shaping this generational flux. The changes wrought on the real/virtual interface one generation after another create a genealogy of such changes over time which are imbedded in the world and act as a foundation for further developments. Each field such as architecture, painting, fashion, and design create individual mutating memory systems that through their interactions with the other genealogies create cultural memory. Cognitive ergonomics unconsciously creates strategies that organize this information reducing "information drag and friction" both synchronously and diachronously.

Cinematic Memory and the "cyborg-ization" of neural networks

"It took researchers two months to train each blue jay to recognize, on screen, moths as food items, but once they did, researchers say the birds went at the images with such vigor that they had to place a protective shield over the screen to keep the jays from shattering the monitors." New York Times (86)

In cinema the variability found in nature is constrained and approximated by its conventions for instance its narrative or non-narrative style, its apparatus and its cultural discourse and then projected upon the screen. Stretching as a large, two-dimensional, rectangular map spread in front of a primed audience it becomes a reservoir of stylistic conventions which are the result of a history of experimentations within its own media and with those of the cultural and ideological fields in which it is folded. "The fact is that, in Godard, sounds and colors are attitudes of the body, that is, categories: they thus find their thread in the aesthetic compositions which passes through them, no less than in the social and political organization which underpins them." (87) In this way the cinematic experience is linked up to the same set of conventions and codes that shaped and pruned the neural networks of the brain in the first

place. The word pruned is important here because it refers to the way that fruit trees are cut in order for their branching to multiply. Here it refers to the way that films are edited to reduce their film load to that which is just necessary to tell the story adequately and believably and relates to the way that the number of neurons in the primary repertoire of the brain is first reduced by the process of neuronal group selection. In the early days of cinema the viewer could not easily make the distinction between the cinematic and real world. We all know of the famous story of the panic of the first audience viewing a train on the movie screen. The audience had to first learn cues of the difference between real and cinematic images. As the twentieth century unfolded more and more of the visual landscape became cluttered with photographic and cinematic paraphernalia either in its pure form as pictures in magazines, billboards, video displays or internet quick time movies or in its coded form in the way buildings look, urban landscape is configured, design is organized or novels are written. Today the balance of the natural and unnatural, organic and artificial has flip-flopped so that the majority of images we perceive and cognate is in fact artificially contrived. My uncle Moni thought the terrorist attack on the World Trade Center that he viewed on the television was a movie and had to be reassured that it was a real event. As a result early childhood memories, what I am calling originary memories, are just as likely to be based on artificial stimuli as organic ones resulting from for instance from a child's long hours in front a television or computer screen during critical periods of object formation and language learning. . Add to this the specialized conditions of these artificially contrived stimuli their phatic potential in the context of a preschool mediated context of cartoons and toy commercials, their ubiquity and linkage to toys they see in shopping center malls and one does not need to be a brain scientist to understand how these types of networks come into being. These early artificial memories become the building blocks of long-term memories which link up with other like memories to form long-term artificial memory or virtual memory networks. These networks form the scaffolding upon and through which new stimuli and new memories, some of which are based on organic stimuli, are folded and woven together. Just in passing I would like to add the that the special temporal qualities of cinema, its' 24 images per second, and video, its' 30 images per second, superimpose another temporal coordinate system on the 40Hz oscillatory potential system already in place. When we watch a film our motor apparatus' has been harnessed to a chair and as the lights are dimmed we transported into a semi-catatose state not unlike a dream where during REM sleep all the muscles of the body are shut except the tiny muscle of the inner ear. Apparent motion, the motion of persons on the screen, simulates our own body's mobility and substitutes itself in our minds eye replacing the normal network of impulses that would configure our own bodies in motion. Thus begins the process of disjunction that causes a de-linking of what Deleuze calls the cybernetic cycle and what we are referring as the perceptual-motor dyad. But Deleuze must wait for the birth of modern cinema which he places around 1945 with Visconti's "Obsession" for this real break to occur. He finds in classic cinema a kind of organicity that is the product of early cinemas dependence on narrative and its investigative analysis of the movement image in which sensation is always followed by an action. It is only later after 1945 that cinema becomes truly modern because this link is broken. A new definition for cinema called the time-image erupts after the war and is defined by a disruption of the perceptual-motor cycle leading to a virtual cinema. It is characterized by what he calls an opsign, or optical sign, which is a visual sensation unaccompanied by a motor component. In our neuro-aesthetic model it is defined by a disruption of the classic relation between the posterior perceptual brain and the anterior action oriented brain. In early cinema the relation of perception to action always maintained a temporal continuity between the past and the present. The body needed to know what the future would hold so that an appropriate action could take place. By its very nature the motor apparatus is predictive. If a baseball is thrown the arm knows where it needs to go to catch it. The body enforces a kind of temporality. Released from this requirement of the body modern cinema is freed from its restraint but it is also freed from narrative time. Past becomes future and future becomes the past. A new kind of non-time joins the idea of non-place. It is to this modern cinema that

Antonioni's "Blow-up" is indebted and is about. For the construction of the twentieth century which the main character Thomas embodies concerns the rupture of the body from the perception-action cycle, the substitution of real memories with virtual ones with the consequent relocation of the actual/imaginary interface towards the imaginary and the final breakdown of temporal contiguity with the future becoming the past and the past becoming the future. As a result the basic neural network structure that is sculpted by these relations is also changed. We must remember that we discover Thomas when he is already a man. His mental and physical condition has already been formed by the twenty-five or so years that preceded our introduction. Years in which modern cinema would have become the predominant form. Years in which the relations that created it like the political, economic, and social conditions caused World War Two would have become imbedded in the world and reconfigured in architecture, painting, media, fashion, and design as well as the plastic arts. For after all cinema is a moving picture of a moving picture. A picture for the Italian Neo-Realists' that captured as closely as possible the essence of the world around them without the artificial "aesthetification" that would characterize later film practice. Twenty years in which those conditions would serve as a template for the configuration of his brain. What effect these conditions would have on the memory structure itself is the question we will next investigate as a way to understand Thomas's mind's disarticulation at the end of the film.

The nature of his predicament concerns the body as it is caught in between two diametrically opposed mnemonic fields. On that references the constructed time-space of the photo-cinematic visual landscape (what we will call the cinematic field) and that of the field of internalized representations developed through a life of relations with the space-time of the organic, "real". (88) These memory fields are quite different. The cinematic one, as the most recent stage in the developmental process of cognitively ergonomically constructed phatic stimuli, represents the most parsimonious approach to the identification and animation what is necessary to convey an illusion of the world though the plastic arts and the other the real which is connected through the bodies action in the material world, its' necessity to predict the outcome of its performances in the context of a complex array of "non-homo-geneous sensations". (89) Cinematic memory is different than that its real declarative and non-declarative counterpart because it is split and dissociated from what has been termed the "cybernetic cycle" which is comprised of a perceptual and motor component. In this cycle every percept is linked to a motor response and there must always be a degree of complicity between the coding of the two. That complicity requires energy to be expended in order to maintain a state of constant translation. Cortical and subcortical structures, like the cerebellum and the hippocampus link the two systems to each other as part of huge neural network systems. (90) The function of these ancillary systems may be to translate one code into another as well as reroute information to other systems which in their own translations extract information that allow for a picture with greater density of information and perhaps even a multidimensional quality. All which together make for a more accurate body adjustment to the incoming data. However this is not without cost. What this could mean is that in their need to be linked neurons and the networks they form must share basic codes imbedded in "linguistic like" structures, like the shared neural signatures that simultaneously stimulated neurons coding for converging inputs share, that allow for their easier deciphering. As such they are tethered together at some level like Siamese twins joined at the hip. The process by which they became unlinked first commenced in the reclining passive state engendered by the conditions of viewing films in the darkened movie theater in which visual perception was not necessarily followed by an action. Of course classic cinema still depended on this connection in the minds eye to create its narrative structure. Narrative cinema with its linear story line still respected notions of the past, present and future and the mind was able to project the outcomes of actions in the future. Modern cinema, on the other hand, rejected this type of mind projection through the introduction of the time-image in which the motor component was unleashed from its perceptual counterpoint. Finally avant-garde cinema by focusing on the apparatus of cinema,

and creating a foundation based on the grid released space from time completely as seen most distinctly in Andy Warhol's, "Empire" or Yoko Ono's "Buttocks". (91) Today video artists like Douglas Gordon and Ackerman are using video installation to put motricity back into the cinematic experience as the subject must ambulate through the cinematic field.

In modern cinema the cinematic memory field is piggybacked on the perceptual component in the posterior part of the brain and as such is released from the frontal cortex and the body's grip. In this way cinematic memory develops a unique kind of uncanny intensity that is usually found in hallucinations and dreams. (92) Hence it is the excision of the motor act from modern cinematic memory is what makes it so different. The large neural networks that link anterior and posterior brain are pruned and as a result the cinematic memory no longer carries the baggage of the motor act. It does not require that the body to react with a movement. Deleuze analyzes this difference in steps. He first quotes Robbe-Grillet when describing the real memory as a sensory-motor image which is organic and cinematic image as purely optical and inorganic. "It would seem first of all that the sensory-motor image is richer, because it is the thing itself, at least the thing as it extends into the movements by which we make use of it. Whilst the pure optical image seems necessarily poorer and more rarefied: as Robbe-Grillet says, it is not the thing, but a description which tends to replace the thing, which erases the concrete object, which selects only certain features of it, even if this means making way for different descriptions which will pick out different lines or features, which are always provisional always in question, displaced or replaced it is of interest to view the cinematic experience, not as some mimicry of the "real," but instead a reified construction of it". (93) Later on he further elucidates this cinematographic image by referring to Bergson. The sensory- motor image, which will construct the sensory-motor memory or what we call the real memory, links a perception image to an action image. The purely optical image which will create a cinematic memory is a very different image first of all because it is a rarefied and pruned image and second of all because its does not link itself to a physical act. In other words "the optical sound image in attentive recognition does not extend into movement, but enters into relation with a recollection-image it calls up." In the final analysis the point is that "they tend ultimately to become confused by slipping into the same point of indiscernibility." (94) Later on Deleuze develops this point further and gives the grounding on which to evaluate Thomas and his crisis of identity. "We gave the name opsign (sonsign) to the actual image cut off from its motor extension: it then formed large circuits and entered into communication with what could appear as recollection-images, dream images and world images. But here we see that the opsign finds its true genetic element when the actual optical image crystallizes with its own virtual image, on the small internal circuit." (95) Is his use here of the word circuit a substitute for the word network and is he implying that these changes are taking place at the neuro-biologic level? I think he is and we will see later what exactly that model is. The key here is that there is a dialectical relation between opsigns and the memories they create with a virtual image. It is this virtual image when it is insinuated into networks that are the result of sensory-motor images that problems arise. The lines of default occur when the sensory-motor representations and the purely optical opsigns make up large neural networks. The need to work together and efficiently is difficult because metaphorically and hypothetically these two systems of memory although insinuated together don't line up because they have been coded differently. It is as if a kind of mimesis occurs between two incompatible systems in which even though much of the structures appear morphologically alike at the deeper levels of their structures they are dissimilar. Like two strands of DNA with similar structures but whose tertiary structures are dissimilar and which causes there bending to bend not alike. One is reminded of Roger Callois and his idea of legendary psychasthenia in which the idea of self is elided with ones surroundings dissolving the boundaries of self and non-self. In this case it is the disruption of the self is caused by the inexact replications of the world that become interdigitated together in large artificial-organic memory networks in the mid-twentieth century; memories that use significantly different codes for time and space relations. Linear

and declarative structures are organized with non-linear, non-narrative, and parallel relations in which time and space are fluid. As we will see the opsigs as pure perceptual phenomena do not contain the neuro-physiologic signatures that allow the body to read them correctly and they become hallucinogenic. Real and virtual become inextricably aligned in fragile memory structures that blink on and off, forever.

Blow Up: The construction of the Twentieth century observer

“If the photographic illusion, as later the cinematographer illusion, fully gratifies the spectator’s taste for delusion, it also reassures him or her in that the delusion is in conformity with the norm of visual perception. The mechanical magic of the anagoric representation of the visible is accomplished and articulated from a doubt as to the fidelity of human vision and more widely as to the truth of sensory impressions.”(97)

The world that assaults Thomas and now all of us is a conglomerate structure in which real and artificial stimuli are sutured together in the landscape of real organic relations as well as those of the cinematic screen and the computer LED. The disruption of the psyche which is the subtext of “Blow Up” and eventually leads to Thomas’s acceptance of an imaginary tennis game as real, is a result of the Neurobiological consequences this insinuation of the artificial landscape upon and into that of the real which together form the template for the sculpting of the brain. The terrain of the visual landscape is a experimental laboratory where these relations can be formed and played with. Their secondary affect on the brain and the brain’s recursive feedback upon it create a kind of symbiosis. One must keep in mind however that there are limits at the margins of each system and that when these limits are reached a kind of noise erupts making coherence impossible. Such is the situation Thomas finds himself in the mid-twentieth century as these two competing systems of representation and analysis are as of yet not necessarily simpatico. Mutations in object form and built space brought on by the invention of photography and cinema are well beyond his brain’s adaptive ability to comprehend thoroughly and weave these new relations into the fabric of his mind. As I have said before he is the product of two competitive and sometimes conflicting mnemonic codification systems. One a product of a kind of mimesis in which similar and synchronous originalities (one from nature and its corresponding Neurobiological counterpart) undergo a synaptic merging and the other, a product of disparate technologies teleologized around an ergonomically driven set of relations. Real and simulated neural networks create pure and composite local and global mappings. Since simulated entities, being ergonomically contrived, act as supersignifiers they will call out to the brain, organizing its neural substrate in powerful ways that overwhelm other inputs. Real inputs and the networks they form will be pushed out because as we have seen inputs that are more ergonomically constructed and appear more frequently will create the most efficient neural networks. The result is a brain that is more and more a product of artificial phatic inputs. This is the predicament of Thomas. As a photographer obsessed with his own images and highly attuned to other like images, his memory systems have been either displaced or replaced by this competitive system of signification. Thomas’s discovery of the murderer and his gun hidden in the bushes is a revelation of monumental proportions. It is a disclosure of the limitations of his body. A body caught in the habits of its own physiognomy and impotent in the face of superior technology. From this point of disclosure, Thomas embarks upon a journey of re-visitations. He goes back to the park to revisit not the space where he was a witness, but back to a space he discovered in the photographs of that place. His gaze shifting as he inspects the site is a re-enactment of similar ones he formulated when viewing the photographic representations of the site. He finds the dead body that is really a reaffirmation of the death of his own body as perceptual organ. The dead man’s eyes are open. He circles the body, and touches it leaving only when he thinks he hears something. But does he? Or is the sound of a broken branch another token of the body’s dismay or lack. Is this what Roland Barth

means when he says "... which I would like to call the Spectrum of the Photograph, because this work retains, through its root, a relation to "spectacle" and adds to it that rather terrible thing which is there in every photograph: the return of the dead." (98) The broken twig is a delusion resulting from a kind of noise that erupts in the grating of memory systems. For the basis of this memory is the photograph of an event he thought was "very still, very peaceful". Returning to his studio, he finds it ransacked and all his photos gone, except one. The blown-up detail is of the dead man, barely perceptible in the landscape of grain that has the appearance of a microscopic slide of brain tissue. With all the evidence of his experience gone, he panics and continues his journey. He follows what he thinks is Vanessa Redgrave, the woman in his pictures, into a rock concert where the Yardbirds are playing but she disappears. He ends up at a party looking for his agent, Ron, whom he entreats for confirmation. He says, "We've got to get a picture of the corpse," to which Ron replies, "I'm not a photographer." Thomas replies, "I am." Clearly, Thomas needs the photographic evidence as corroborating proof to his own sensorium. Ron, sensing something is amiss, asks, "What's the matter with you?"... "What did you see in that park?" Thomas can only reply that he saw "nothing." He had seen nothing. He wakes up alone surrounded by the remnants of the party of the night before. The next scene is in the park where, for the third time, he re-visits the site. This time, the body is again missing as his camera dangles limp from his hand. He again inspects the site but the directness and forcefulness of the gaze is lacking. He is no longer sure what is real or what happened. It is as if the two accounts have canceled each other out and left him as an amnesiac. This leads to the final rupture of the film where Thomas willingly accepts the imaginary tennis ball as real, even to the point of retrieving it after it has apparently been hit out of the court. This marks an end point in the ontogeny of his bodily disconnection and a final collapse of the real.

Conclusion

Networked relations in the real world configure network relations in the brain. Photography, cinema and now new media have done much to change the way time and space is encoded into the networked relations of the world and have done much to reconfigure the real world into a real/virtual interface. Fields of phatic signifiers have been artificially created to capture the attention of the human observer. Utilizing a strategy I have termed cognitive ergonomics artificial stimuli have been engineered to have superior attention grabbing capabilities beyond their naturally created counterpart. As such these artificial stimuli compete more affectively for the neural space as they configure superior neural network configurations that are faster and more efficient. These ergonomically contrived network systems have selective advantage over those that are not and thus crowd out those less selective neural networks. Somewhere in the midst of this ontogenetic process we meet Thomas, the main character of "Blow-up" who suffers through a predicament beyond his control. A kind of disease of the late twentieth century we might call "artificially induced disparate memory syndrome" in which organic and artificial memory systems compete for consciousnesses attention leaving the subject distraught and disassociated.

Notes and Bibliography

1. Postmodernism, The Cultural Logic of Late Capitalism, Fredric Jameson, Duke University Press, 1991, page 38.
2. The Deleuze Connections, John Rajchman, M.I.T. Press, 2000, page 11.
3. Much has been written about the reasons for this and a whole field of cinema studies has developed around what is referred to as "Cognitivism" by Noel Carrol and others. For an in-depth analysis of these theories see Post-Theory, Reconstructing Film Studies, Edited by David Bordwell and Noel Carrol, The University of Wisconsin Press, 1996.
4. Privacy and Publicity, Beatriz Colomina, M.I.T. Press, 1996, page 128.

5. I am using the term cinematic/virtual image to update this discussion to reflect changes occur in cyber-culture as well as to draw attention their historical relations.
6. The Vision Machine, Paul Virilio, Indiana University Press, 1994., page 14.
7. Ibid, Virilio, 1994, page 13
8. “Today professional and amateur photographers alike are mostly happy to fire off shot after shot, trusting to the power of speed and the large number of shots taken. They rely slavishly on the contact sheet, preferring to observe their own photographs to observing some kind of reality. “ Ibid, Virilio, 1994, page 13.
9. “A Short History of Photography”, Walter Benjamin,
10. “ Techniques of the Observer”, Jonathan Crary, MIT Press, 1990.
11. Ibid, Rajchman, 2000, page 122.
12. “The Remembered Present”, Gerald Edelman, Basic Books Inc., New York, 1989, pg. 44.
13. “Before Photography, Painting and the Invention of Photography”, Peter Galassi, Museum of Modern Art, New York, 1981, pg.12, “It is, in other words, a tautology, which in effect remands the interpretive burden to the scientific tradition. The object here is to show that photography was not a bastard left by science on the doorstep of art, but a legitimate child of the Western pictorial tradition.”
14. “Les Commissariat aux Archives, Les Photos Qui Falsifient L’histoire”, Alain Jaubert, Edition Bernard Barrault, 1986.
15. Eduardo Cadava has pointed out in his introduction to his seminal book, “Words of Light”.
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17. “Neuronal Models of Cognitive Function”, J.P. Changeux and S. Dehaene in Brain Development and Cognition, Ed. by Mark H. Johnson, Blackwell,1993, pg. 363-397.
18. Ibid, J.P. Changeux and S. Dehaene, 1993.
19. “Engaging Perspectives: Film, Feminism, Psychoanalysis, and the Problem of Vision“, Kate Linker, pg. 221 in Hall of Mirror, Art and Film Since 1945, organized by Kerry Brougher, MOCA, 1996
20. Ibid, Edelman,1989, pg.50.
21. For detailed analysis of this concept please see Maya Dern, “Cinematography: The Creative Use of Reality” and Colin MacCabe “Theory and Film: Principles of Reality in Film Theory and Criticism edited by Gerald Mast, Marshall Cohen, and Leo Braudy, Oxford University Press, New York, 1974.
22. “Scopic Regimes of Modernity, Martin Jay in Vision and Visuality, ed. Hal Foster, DIA Art Foundation, Bay Press, Seattle, 1985, pg.9.
23. Ibid, Martin Jay, 1985, pg.16.
24. Ibid, Martin Jay, 1985, pg.17.
25. Critique of Judgement, Immanuel Kant, translated by J.H. Bernard, Hafner Press,1951
26. Ibid, Kant, 1951.
27. I am using architecture as an example keeping in mind that this argument could be made for design, fashion and art just as well. I am addressing the neural network configuration of the brain aware of the fact that I may be making an argument for the mind.
28. Privacy and Publicity, Beatriz Colomina, MIT Press, 1998, pg 73.
29. The Brain is the Screen, Deleuze and the Philosophy of Cinema, editor. Gregory Flaxman, University of Minnesota Press, 2000, pg.31.
30. Warped Space, Anthony Vidler, MIT Press, 2000.
31. Architectonic is a word that is used in neurobiology to describe the distinct cellular organization of specific areas of the brain. For instance the columnar arrangement in the visual cortex.
32. It is now widely appreciated that the process of plasticity extends well beyond the early life of the human into adulthood and is responsible for such phenomena as “Remapping” in which neural networks become reconfigured in order to take over the function of adjacent areas which have become non-functional due to loss of afferent input. “ Finally, some reorganizations may

not mediate recoveries...but may produce further malfunction by producing inappropriate responses to sensory stimuli. For example, mislocalization to an amputated arm of sensory tactile stimuli on the face in humans may be a result of the reorganization of the somatosensory representations so that cortex normally activated by the arm is activated by receptors in the face, as can occur in monkeys with sensory loss. "The Reorganization of Sensory and Motor Maps in Adult Mammals", Jon H Kaas, *The Cognitive Neurosciences*, ed. Michael Gazzaniga, MIT Press, 1995.

33. Kracauer, Seigfreid, "Photography" In *The Mass Ornament: Weimer Essays*", translated by Thomas Y. Levin, Harvard University Press, 1995.

34. For instance Johannes Muller's work in 1826 on subjective visual size in relation to the retinal image, Edvald Hering's theories on visual space perception in 1864, Hermann Ludwig Ferdinand von Helmholtz's theories of three color vision and specific nerve energies, 1860 and Charles Wheatstone on binocular parallax and stereoscopic perception, 1838 are occurring at around the same time as inventions such as the chromatrope, for blending surface colors, the zoetrope which was incidentally invented as a toy bases on the persistence of vision and only later was used to create a moving image, and the polariscope which by the use of polarized light causes the creation of complementary colors and a variety of optical illusions. The end of the nineteenth century was also notable for a plethora of devices which had direct connections to the photography and cinema such as the Wheatstone Stereoscope, Chronophotographic camera used Etienne Jules Marey, Emile Reynaud's projecting praxinoscope, the Zoetrope, Georges Demeny's phonoscope, Ottomar Anschutz's electrical tachyscope and finally the cinematic camera's used by Thomas Edison and the Lumiere brothers.

35. Ibid, Colomina,,1996.

36. I am using the term curved here to refer how light is curved by intense gravitational fields emanating from a black hole

37. Ibid, Paul Virilio, 1994, pg. 14

38. For the sake of this discussion I am limiting myself to a discussion of the visual apparatus, visual field and visual landscape. The visual apparatus consists of the eye, its appendages, such as the eye muscles, and its connection to the brain. The visual field is the visual limits of the spatial and temporal projection of the world on the retina. The visual landscape is all the cultural artifacts that clutter the visual field. I am also only talking about the field of phatic signifiers at this time although I am aware of a diametric opposed field which exists in parallel called the field of discursive signifiers which is a reservoir of signifiers at odds with the academic suppositions of the field of phatic signifiers. It is to this field that artistic practice can at times be tuned and from which it can extract new variables to contaminate the ongoing discourse.

39. "Neural Darwinism", Gerald Edelman, Basic Books, 1987.

40. Ibid, Edelman, 1987, pg. 5,6.

41. Ibid, J.P. Changeux and S. Dehaene, 1993

42. "The Techniques of the Observer", Jonathan Crary, MIT Press, 1990.

43 Mutating here in the sense of a changing neuro-synaptic configuration.

44. "A Thousand Years of Nonlinear History", Manuel De Landa, MIT, 1997, pg.

45. Ibid, Flaxman, 2000, page16.

46. Ibid, Deleuze, 1986, pg. 4.

47. Ibid, Deleuze, 1986, pg. 7.

48. Ibid, Flaxman, 2000. pg.32.

49. "The Film History of Thought", Andras Balint Kovacs in *The Brain is the Screen* ed. Gregory Flaxman, University of Minnesota Press, 2000.pg.164

50. *Cinema 2, The Time-Image*, Giles Deleuze, University of Minnesota Press, 1995, pg. 69.

51. Although *KinoGlaz* (*Kino Eye*) was made in 1924 way before Visconti's *Obsession* which Deleuze marks as the dividing line of modern cinematic practice I use this as an example because many of the practices used in this film were in fact counter to the Hollywood films being made and sound more like modern cinema experimental films of the sixties. Here is

a quote from *Kino-Eye: The Writings of Dziga Vertov*, Annete Michelson, University of California Press,

Kino –eye is understood as that which the does not see. As the microscope and telescope of time. As the negative of time. As the possibility of seeing without limits and distances. As the remote control of movie cameras. As tele eye, as X-ray eye, as life caught unawares ect. ect.. Later sounding more like neo realism, “Not filming life unawares for the sake of the unaware. But in order to show people without masks, without makeup, to catch them through the eye of the camera in a moment they are not acting, to read their thoughts, laid bare by the camera.”

52. Ibid, Crary, 1990, pg.132.

53. ‘Mimicry and Legendary Psychasthenia’, Roger Callois in *October: The First Decade, 1976-1986*. MIT Press, 1988.

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59. Ibid. James Peterson, 1996.

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63. Ibid. Edelman, 1989.

64. *Memory in the Cerebral Cortex*, Joachim M. Fuster, MIT press, 1995.

65. Ibid. Fuster, 1995.

66. *The Origins of Cultural Diversity*, Janusz K. Kozlowski, in *Origins of the Human Brain*, ed. Jean-Pierre Changeux and Jean Chavaillon, Foundation Fyssen, Clarendon Press, 1996.

67. “Making Images and Creating Subjectivity”, A.R. Damasio and H. Damasio in *The Mind Brain Continuum*, ed. by Rodolfo Llinas and Patricia Churchland, MIT Press,1996.

68. Informational susceptibility is a term which defines how the predetermined arrangement of the primary repertoire provides the basic building blocks with which to build understanding. It is important to mention here that it is my opinion that language is always implicit in the way that the world is configured. The developing child must build the neurobiological apparatus to sense it. That is to say that the child interaction with the environment helps it build the neurobiologic apparatus with which to perceive the inherent linguistic metaphors that are built into the world. Selective development as it is slowly sculpted by these unconscious relations is a process of building categories of superimposed and collaged networks, local and global, that eventually will give the brain the structure to understand and produce language.

69. Ibid. Edelman, 1989.

70. *Brain Development, Plasticity and Behavior*, Bryan Kolb, in *Brain Deveopment and Cognition*, Ed. Mark H. Johnson, Blackwell. 1993.

71. Ibid. Damasio and Damasio, 1996.

72. “The Brain as a Closed System Modulated by the Senses”, R. Llinas and D. Pare in *The Mind Brain Continuum*, ed. by Rodolfo Llinas and Patricia Churchland, MIT Press,1996.

73. Ibid. Jonathan Crary, 1990.

74. *Memory in the Cerebral Cortex*, Joaquin M. Fuster, MIT Press, 1995.

75. I think the term individual memory is more clear and introduces the idea of how the unique qualities of the human being can be developed.

76. Ibid. Fuster., 1995, pg. 181

77. We will see later in our discussion that when we talk about the categories of cinema that perhaps these designations link up to some of the Deluzian models of the sensory-motor schema. That the movement image could be linked to the latter designations of the premotor and motor cortex while that of the time image might find some relation to the time based prefrontal cortex.

78. Ibid. Fuster, 1995, pg.97

79. Parcelization can also refer to polymodal experience. Most of our experiences are based on images of several sensory modalities occurring within the same window of time. Since the early sensory cortices for each modality are not continuous and are not directly interconnected, it follows that our polymodal experiences must result from concurrent activity in several separate brain regions rather than a single one." In "The Mind-Brain Continuum" R. Llinas and P. Churchland, The MIT Press, 1996.

80. "Temporal Mechanisms in Perception", E. Poppel, In Selectionism and the Brain, ed. O. Sporns and G. Tononi, Academic Press, 1994.

81. Ibid. Fuster, 1995.

82. "Binding by Specific –Non-Specific 40 Hz Resonant Conjunction", R. Llinas and D. Pare in The Mind Brain Continuum, R Llinas and P. Churchland, MIT Press, 1996.

83. , Privacy and Publicity, Beatriz Colimina (MIT Press, 1998): 73.

84. Constructions, John Rajchman MIT 1998.

85. I of the Vortex, from Neurons to Self. R. Llinas, MIT Press, 2002.

86. "What do Blue Jays Like To Eat: Ask a Virtual Moth", Carol Kaesuk Yoon, New York Time, October, 13, 1998.

87. Cinema 2, The Time-Image, Gilles Deleuze, University of Minnesota Press, 1996.

88. In the case of Thomas and his character in the 1960's this mutation occurring in built space was still in its formative stages and neither form predominated. Today one might say that the cinematic field with its link to the virtual computer based realities predominates

89. What I mean here by non-homo-genous sensations refers to a stimulus array that is shared by all the phylum of nature living together in the matrix of relations we refer to as nature. Whereas in the cinematic field these phatic relations have been constructed for the proclivities of the human nervous system. They are thus more specific for it being tuned to its neuro-physiological channels.

90. "While sensation and perhaps certain aspects of perception can proceed without a contribution of the motor apparatus, perceptual categorization depends upon the interplay between local cortical sensory maps and local motor maps: these, together with thalamic nuclei, basal ganglia, and cerebellum, interact to form the global mappings that permit the definition of objects as a result of continual motor activity." Neural Darwinism, Gerald Edelman, Basic Books, 1987.

91. Virtual reality is the latest formation in the genealogy of this discourse and as such reinvents space and time in terms not of an observer or real subject but simply as a machine with machine memories. For the purposes of this discussion however we are restricting ourselves to the cinematic field and cinematic memory with the hope that it will open up possibilities for later understanding time and space in relation to new technologies.

92. We already discussed the way the body is shut down during dreaming. Can you imagine an animal in the bush whose body was moving in relation to the action of a dream? It would be an easy target for a predator.

93. Ibid, Deleuze, 1996, page 45.

94. Cinema 1, The Movement-Image, Gilles Deleuze, University of Minnesota Press, 1996. page 45 and 46.

95. Ibid. Deleuze, 1996.

96. "Mimicry and Legendary Psychasthenia", Roger Callois in October the First Decade, 1976-1986, ed. Michelson and all, MIT Press, 1988.

97. "Machines of the Visible", Jean-Louis Comoli, in Electronic Culture, ed. Timothy Druckery, Aperture, 1996.

98. Camera Lucida, Roland Barthes, translated by Richard Howard Hill and Wang, 1981.