

Angels with Nanotech Wings: Magic, Medicine and Technology in Aronofsky's *The Fountain*, Gibson's *The Neuromancer* and Slonczewski's *Brain Plague*.

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Entry: Angels with Synapses

How many angels can dance at the head of a pin? This question perplexed Medieval and Renaissance scholars. For them, the fantastic was not a matter of science fiction, but science fact. There was much debate as to whether angels were material entities or forms of energy. Curiously, angels and spiritual accomplices are re-appearing in the current *zeitgeist*. On the lecture site "Ted.Com," the author of *Eat, Pray, Love* (2006), Elizabeth Gilbert makes a powerful plea for protecting our metaphors of creativity by re-adopting the Platonic models of the 'demonic.' Cited in "The Myth of Er" (Book X of Plato's *Republic*), this spiritual entity is acquired by human souls in their pre-lives before they arrive on the planet. The *diamon* then accompanies us on our human journey, helping us to deliver on our pre-ordained purpose. If we avoid our destiny, it can quite literally raise hell. The *diamon* is also the accompanying 'genius,' or 'spirit.' Gilbert takes on this concept to suggest that we will be saner as artists if we drop the idea that it is humans themselves who are the geniuses, considering instead that we are aided in our creativity by forces beyond us. As literary scholar and ecologist Harold Fromm reminds us, from the ancients referring to their Muses, Milton speaking of his "Creator Spiritus" and W.B. Yeats surrounded by his writerly spooks, traditionally, many literary practitioners have been open minded towards spiritual discourses (2005). Gilbert's lecture might signify a revitalizing of the idea that artists need their mystical accomplices.

Yet there is a further twist. In the opening section to his article, Fromm suggests in his title "Muses, Spooks and Neurons" (2005) that there is a connection between the phenomenon of capricious spirits and neuroscience. Both spirits and neurons, argues Fromm, destabilize our sense that the mind is run by a brain with a "central meander" to use Daniel Dennett's term (quoted in Fromm, 2005: 147-148). The "Cartesian Theatre" is undermined (148) by spirits which come when least expected and rarely perform to order. Indirectly, Fromm compares this lack of central planning with the brain's electrical activity across the synapses. As neuroscientists have pointed out, neural feedback loops can operate irrespective of human

will.¹ The same thoughts and obsessions return, as the brain receptors connect along the same grooves, the repetition process constituting a hard-drive that can function as an ‘unconscious.’ Artists rely on the unconscious but never know when the angel or demon of inspiration will spirit out.

Following Fromm’s insight, I will be examining how some selected examples of cinematic and literary aspects of the ‘neuroscientific’ turn can find a strange bedfellow in what might be called, in the wake of Gilbert’s lecture, the ‘magical’ turn. Discourses of religious myth and the occult can collapse the boundaries between external worlds and internal minds. In Darren Aronofsky’s *The Fountain* (2006), Tom (played by Hugh Jackman), a neuroscientist, attempts to save his lover Izzy (Rachel Weisz). This is one of three thread stories, Hugh Jackman playing Thomas, Tom and the Space Traveller, all in three different historical and time-space setting: Renaissance Spain, North America in the present day, and somewhere in a space ship that is floating towards a dying star. Thomas wants to find the Tree of Life under a Mayan Pyramid for the sake of Spain’s survival in the face of the Inquisition. Tom wants to cure Izzy using a tree herb from a South American Country, and the Space Traveller wants to save the Tree of Life in his space bubble; he can only do this by himself and his Tree passing through the quantum field or event horizon (the spectator is invited to imagine many possibilities) of the dying star. This is the only strategy with which to rejuvenate the tree. Tom’s internal struggle is mapped out in the two parallel thread stories. When Thomas the conquistador seeks out the Tree of Life, this mythical and magical quest reflects Tom’s journey as a neuroscientist. Boundaries between events in the world and those in the brain are further subverted in the way the film make both the Tree and images of star clusters stand in for neural networking.

Such representations invite readings which have now been frequently identified with the Deleuzian concept of the “time-image.” In his influential *Time Image*, Deleuze quotes Artaud’s remarks that what can be brought together is “cinema” with “the innermost reality of the brain” (Deleuze, 1989: 167). The move that Deleuze then makes is to insist that this “innermost reality is not the Whole, but on the contrary, a fissure, a crack” (167). For Deleuze, Artaud recognizes that the cinema spectator undergoes the “dissociative” forces of spectatorship. The ‘picture of the world’ through cinema and neural perceptions which are,

¹ See Doidge, Norman, *The Brain that Changes itself* for a fuller exploration of intention, character and feedback loops.

according to Deleuze, so closely aligned to cinematic perception, can no longer display the bigger picture. Rather, the latter is replaced by a non-hierarchical flow of images in which coherent, hermeneutically organized meanings give way to time images focusing on time rips and moments of suspension between images. What arises is the “psychic situation of the seer, who sees better and further than he can react, that is, think” (170).²

Tom takes on the role of a ‘seer’ in a parallel way to the Space Traveller. Tom often becomes fixated on single images of him kissing the back of Izzy’s neck, speckled with hairs like the living hair on the Space Traveller’s Tree of Life. It is as though his vision becomes a set of optical illusions organized around the primary image of tree and brain. For these images are not documents so much as images which if believed strongly enough, as in the Space Traveller’s faith, become living events. As Patricia Pisters explains in her forthcoming analysis of *The Fountain*, “contemporary cinema has quite literally entered the mind of its characters, playing all kinds of tricks with the mind of the spectators as well” (2010: in press). The mad scientist becomes a favorite hero, and in Aronofsky’s work, is often a character caught up in questions of spirituality and magic. In *PI*, Max, the mathematician-protagonist will run into a group of Cabbalists enlisting his mathematical expertise. In *The Fountain*, mysticism, magic, the Tree of Life, neurophysiology and the idea that the universe’s star fields are themselves an eternal brain all offer themes carrying the two paradigms that are at my concern here. For as I shall argue, the two radically different approaches can work together when it examining how magical and neural ‘technologies,’ either in science or science fiction, help us more effectively understand the creative process which fascinates Elizabeth Gilbert.

It is because of my concern with ‘creativity’ that I will be reading *The Fountain* through the help of two novels, both very close in their concerns to Aronofsky’s film. Joan Slonczewski’s *Brain Plague* (2000), a lesser know work, read together with William Gibson’s cult classic *The Neuromancer* (1984), actively take up the theme of brain activity touched by the magical, medical and technological. *The Fountain* deploys the principal that the Tree of Life, one of the trees cited in Genesis, can be a source of healing. But the entrance to the cure

² I want to thank Professor Patricia Pisters of the Media Department, University of Amsterdam, for pointing out these quotes, all apposite for my article. She herself uses these quotes in a forthcoming publication, in which she reads both *PI* and *The Fountain* in terms of the ‘time-image’ and neurosciences. She comes up with the concept of a “neuro-image.” For me, the benefit of her approach was to draw my attention to the concept of the “seer.” I also want to thank Liz Dale for alerting me to the Elizabeth Gilbert talk on Ted. Com.

requires neural technology. Tom's experimental monkey is administered the South American tree-medicine through brain surgery. In *Brain Plague*, a novelistic 'buddy movie' about the relationship between a struggling artist Chrysoberyl and an accelerated culture of sentient cells, the microbes which trespass into Chrysoberyl's body, summon her neurally in the voices of Old Testament supplicants praying to their god. In Gibson's novel, one manifestation of the cyberspace system's artificial intelligence, or AI, calls itself 'Neuromancer.' The word itself hybrids together discourses both neurological and black magical. Necromancers like the 17th century John Dee, claimed to raise demons. Artificial intelligence is a force which science has confidently predicted or denounced as impossible. AI remains the stuff of science fiction, and in Gibson's novel, its connection to evil spirits is made explicit in the novel's title. Moreover, the main plot of the novel finds its protagonist, Henry Dorsett Case, a computer hacker, punished for his theft by having his central nervous system damaged with mycotoxin, leaving him unable to 'jack' into the neural computer system. He seeks out the cure in the form an untested, neural, or 'nano' technology. For the protagonist of *The Fountain*, the Tree cure works at a micro level through the quantum field of a store can rejuvenate the Tree of Life, read, eternal life. *Brain Plague* features who communities of microbes who carry nano-theological agendas.

Both *Brain Plague* and *The Fountain* were published/produced within five years of each other. Both these works offer footnotes to *The Neuromancer*, a work which considers eternal life within the the schemas of AI, and how the matrix, tree structure of this intelligence can offer itself as an 'eternal' tree. Moreover, Gibson's novel concerns itself with the links between medical intervention and spirit conjuring technology. In all three works, the nanotechnological aspects of magic or neural intervention, offer insights into how the creative mind can best work to support its own healing processes. The Angels that appear between the discourses of magic and neuroscience are often miniscule yet powerful.

Nano Angels

Angels, suggested their first scholars, might dance at the end of a pin. One year before the publication of *Brain Plague*, one of many projects posed technologies that now are now bearing fruit. Ten years ago neural-enhancers were being developed into nanotechnological robots. A then associate professor of molecular and pharmacology and toxicology, Dr. Roberta Dia Brinton was developing a "neurochip"(Networker@USC, Jan./Feb 1999). This silicone device can be planted into the neural connections of the brain, and compensate for

basic genetic dysfunctions in neural tissue. Now, there is an entire field of “Nanorobotic” studies that engineer molecular-sized devices that can ‘operate’ on brain aneurysms (Cavalcanti, 2009). These minute harbingers of healing find many forms, be they electrical or purely chemical. The capacity of specialized nanorobots to operate on neural tissues suggests the Deleuzian ‘crack’ in perception, if it is treated sometimes as a problem rather than a seer’s alternative vision, can be remedied under certain conditions.

An implacable brain tumor is Tom’s core problem in *The Fountain*. The tree unguent from South America that enables a monkey to become younger cannot treat brain tumors. The rub of the problem is how can a healing agent be introduced into the neural landscape. The film sets up a network of images which suggest that the secret lies in a route of connecting fibers between the body and the Tree of Life. The Space Traveller paints himself with Tree rings in act of bizarre identification with the tree which he protects on their journey through space. Towards the film’s climax, the Tree is almost dead, although the Space Traveller is alive. It could be the line by line tattoos on his body, the assemblage of tiny stripes that allows him to mind-image the Tree back to life. Or the Tree’s trajectory through the dying star, meets the angelic micro-particles of the underbelly of the dying star: a black hole. For the neuroscientist Tom, death is not an existential state, but the consequence of a disease. It is only the miniscule angels that might have a chance to do their work.

Addiction and neural damage are states to be approached from the smallest dimensions. Both *The Neuromancer* and *Brain Plague* seize every opportunity to throw their characters into countless situations of neural damage and drug addiction. In a time of Mexican influenza and the ghosts of SARS capable of becoming microbes again, readers can readily identify with Chrysoberyl’s risk venture. Allowing her brain to become the Promised Land for a culture of religiously minded microbes, Chrys gains their powers off immunization, but also accepts them as team-mates to help her build a commissioned city called Silicone. Jonquil, one of the leader cells, declares the human project to be completely in line with that of the miniature world (chapter 13). Similarly, in Gibson’s novel, *Neuromancer* implies that Case’s role requires that he learn the correct codes to call up a burgeoning artificial intelligence (chapter 21). Case may be posthuman in his connection to cyberspace, but his contribution to the AI system - chemical, emotional and unpredictable - cannot be dispensed with.

Humans present the larger systems, be these the immune system, the brain or the universe, with infections, nano particles and Trees that can intervene to reboot the encompassing matrix. But this often happens through ‘cracks’ in the vision of the seers who

guide in the smaller entities. Tom and the Space Traveller never entirely know what they are looking for or at, so much occurs through blind and cracked faith. Gibson's protagonist Case works best when he works heuristically. Chrys is on a continued learning curve in response to her tiny visitors. Often, the virus, technology or neural act of perception is angelic, required to come and save the diseased large body. But there is also a price to pay in the magical technologies of small particle healings and neural moments of insight. The moment of 'reboot' is beautifully imaged in *The Fountain* when Thomas, the Spanish conquistador, becomes greedy when he eats huge portions of Tree. The Tree explodes within him, flowers and tree roots propelling out of his body. Thomas becomes one with the tree, his organic humanity absorbed. The human system is rebooted into a type of Deleuzian "becoming tree."³ In both the film and the novels, be it the AI system in which Neuromancer resides or the human body and brain that is plagued or *The Fountain's* quantum gravities that resuscitate the Space Traveler, large network is entirely dependent on intervening, small particles. It is the ability to re-envision a system through a 'cracked' perception, with the aid of small angels that the system can re-code itself from within.

Grabbing the Angel by the Tail

"Creativity" is a concept that calls for clarification and attracts censure. Elizabeth Gilbert's meditation on the *diamonic* involves a striking story from the American poet Ruth Stone. Gilbert tells Stone's story of waiting in her house on the plains, and hearing a 'poem' pelting towards across the landscape and towards her. Stone talked about once grabbing a poem by the tail, then pulling it onto the page. The poem, she said, came out backwards, before she wrote it the right way around. The point is that the artist cannot be alone in her work. There are other forces waiting in attendance. Even in Walter Benjamin's celebrated "The Work of Art in the Age of Mechanical Reproduction" (*Collected Essays*, Hannah Arendt), he explores how the 'work of art' has an ineffable quality. But this is provisional and vulnerable. The 'aura' around a painting fades when reproduced through catalogues, photographs and copies. Benjamin argues that words such as "creativity" and "genius" have become outmoded. The

³ See Deleuze and Guattari, "Becoming Intense, Becoming Animal, Becoming Imperceptible..." in a *A Thousand Plateaus* for a poetic analysis of how human consciousness can experience itself as particles that connect with animals, trees, witches and all manner of natural and mystical entities.

model of the powerful and solitary creative spirit becomes discarded in an age where reproduction begins to produce a technology of creativity.

Thomas, Tom and the Space Traveller of *The Fountain* manifest strongly symbiotic relationships to their muses and sources of creativity. Yet these sources can present the status of being a prosthetic. *The Fountain* is the name of the Mayan mythic adventure that Izzy writes before her death. It is in this work that she sets out a narrative of death as the site of re-birth, and Tom finds both her and her story a source inspiration for his life's work. For the Space Traveller, his Muse and mode of survival, is the quietly talking Tree of Life, which he treats as a woman, when personified in the form of an angelically appearing Rachel Weiz. It is as if the Tree is the Space Traveller's prosthesis. And he survives his excessively long life by feeding on the tree's herbal medicine. Chrysoberyl, the main character of *Brain Plague* and Case, the protagonist of *The Neuromancer*, do not operate as independent beings. They can only perform creatively with the aid of prostheses, pharmacological drugs and in Chrys' case, on microbes. For Case, super-hacking requires learned competence from systems with vast and already formulated rules. He can only outface his AI opponents Wintermute and the Neuromancer through spontaneity. Case is the rightful precursor of Neo, from the blockbuster movie *The Matrix* (1999). Played by Keanu Reeves, Neo learns that his only advantage against the 'Matrix,' or the vast AI network, is the act of breaking rules. AIs cannot improvise. Humans can. With an ability to play the system brilliantly, but also to be unpredictable and emotional, humans can overwrite the apparently triumphant cybernetic system and its agents. Creativity, then, is the act of making unexpected moves and dealing with unknown consequences.

The cliché that creativity is an aggressively individualistic act is subverted when keeping in mind there is a relationship between desire to acquire prosthesis and the need for an angelic assistant. Creative work is rarely left touched by culture and its collective concerns. One of the field's pioneers, Mihaly Csikszentmihalyi, has provided a definition of creativity which resonates uncannily with *The Fountain*, *The Neuromancer*, *Brain Plague*, neurochipping and nanotechnology. Any domain of practice, be this the visual arts or biology, has its own fields, such as multimedia design or neurobiology. "Creativity occurs" clarifies Csikszentmihalyi, when ...a person using the symbols of a given domain...has a new idea or sees a new pattern, and when this novelty is selected by the appropriate field for inclusion into this relevant domain. The next generation will encounter that novelty as part of the domain

they are exposed to, and if they are creative, they in turn will change it further. Occasionally creativity involves the establishment of a new domain (1996: 28).

Novelty and the breaking of patterns, is a crucial part of a healthy mind remaining creative. When synaptic impulses in the brain go around in the same old grooves, ossifying behaviors of mind and symptoms of addiction can set in. A negative aspect of the ‘feedback loop,’ or the phenomenon in which a situation sets off an electrical impulse of emotions which causes someone to fall back into the same old story (as in the obsessive “I can’t drop this habit”) is that this loop will ‘want’ to repeat itself. The brain becomes addicted to certain chemicals triggered by a specific loop which will set off the replaying of the accompanying narrative.⁴

The Fountain often deploys repeated shots, as well as scenes, to dramatise this ‘nature’ of the brain’s feedback mechanisms. Tom is often shot in extreme close-up kissing the hairs on Izzy’s neck. The Space Traveller is caught in a similarly revealing shot, one that repeats itself, when he strokes the hairs of his Tree. Again and again, Tom, in his incarnations, returns to the same images, as though addicted to them. And when the spectator has been exposed to a sufficient set of repeated images, we do get the feeling that Tom and his incarnations will be going around in the same synaptic circles for eternity. However, the film allows Hugh Jackson’s character to break the pattern, to introduce a new idea, a new choice between synaptic pathways that liberate a nano ‘moment’ of new decision and new consequences. Tom return to a points that has repeated itself in his mind endlessly; he once avoided going off for the first snow walk of the season. Tom revisits this moment and does decide to go for that walk with Izzy. This one action sends a set of ricochet shifts in pathways, in the forking paths of the narrative, and this has consequences for the Space Traveller’s story. Desperately thinking his Tree has died, and willing it to be alive, both Tree and Traveler discover their death and birth point. It takes the Tree to ‘decide’ to die to force the issue. Thomas the Conquistador, against all the odds, discovers the Mayan Tree of Life, and becomes the object of his investigation, forming an image of a Green Man, that when the camera pans out, he looks like a body of neurons. Yet this Green, neural and natural organism has rapidly evolved from the intake of a magic herb, that is, a form of medication.

⁴ See Doidge, “Brain Locked, Unlocked.” He explains how emotional narratives are connected to feedback loops and suggests how the brain’s plasticity can overcome these. His work brings together what are now received ideas in cognitive psychology and neurobiology. See also J. Melvin Woody and James Phillips for an approach which connects neuroscience as a narrative model with that of Freud’s “Project for a Scientific Psychology.”

In fact, *The Neuromancer* is a world characterized by the one underlying fact: there is no creative life, no possibility of making a difference, no path to a colorful existence, without prostheses and medication. These nanotechnological additives are the insurance that new neural pathways can indeed be transited. Dermatodes link Case into his adventures and benthylmethane (a fictional drug) control the emotional perils of his virtual life. In his battle with AI life, the enigmatic Neuromancer and his sidekick Wintermute, Case tackles products of the system that have developed their own agenda. In Gibson's novel, the relationship of cause and effect between creative thinking and medical cures, becomes inverted and diversified. The macabre alliances between electrodes, medication and human tissue are what produce AI. And here is the rub: the AIs have not been birthed from intention, but are the results of endless collisions by trial and error. The survival of the fittest is a lottery born from endless interactions. It is these endless algorithms of connect, disconnect, failure and success all evolve from fractures in vision, in moments of 'seer-ing' and in a refusal to be dominated by some bigger picture.

Creativity is a matter of neural surprises and untested paths. Magic could be regarded as a miracle of novelty, the habit that we thought we could never break, but the habit which we do break. The leap forward is small, a nano step from one path to the next, and a moment's unpredictability beyond calculation. Despite the wish to quantify angels, many acknowledged the angel as numinous and beyond measurement. Perhaps the metaphor of the angel persists because we know that in the creative enterprise, be it scientific or artistic, there is always the unknown element, the path not taken, the inspired decision, the lightening in the bottle that cracks out of the glass – the angel that is ephemeral but magically functional. Biomedical science will quantify and control, but when the angel of unpredictability shakes its wings, the chaos of weird science will out.

Closure for Now: the Memes in the Machine

The potential creations of medical technology are more pervasive than a single Frankstein's monster. Today, be it through the prostheses of nanotechnology, medication, neurochipping and neuroscience, we are partially sighted seers who, paradoxically, multiply our knowledge through this difficult position of inspired perception. Any pattern we perceive, natural or synthetic, can be broken down, re-produced, disseminated into more freely modulated structures. The smaller versions iterate the larger structures. Nanotechnology can explore and compute the natural fractal landscape of the human body in quest of disease. K. Eric Drexler,

who coined the term nanotechnology, has written about the ‘tiny machines’ of DNA/RNA protein cells. Star-studded and with exotic atoms, these contraptions make ‘assemblers.’ These miniscule miracles can re-programme bacteria and blood cells. Inevitably, they should be able to make semiotics with brain cells. Potentially, microchips and neurons will be able to ‘talk to each other.’ Here would be the moment when the organic and inorganic glue together like never before. They would make a consciousness which as yet, no one has sampled. The miniature worlds might become a source of dependency to the macrocosm of daily, human consciousness. By so doing, these micro-angels of artificial intelligence are becoming the new memes.

While not the genes themselves, memes are their powerful relatives. As a metaphor for genes, the meme swims around in the pool of information and ideas which jump from one generation to the next. Richard Dawkins lists many items that can jump, from catch phrases and techniques of building arches to broader bodies of thought (*The Selfish Gene*, 1976, qtd. and expanded on in Drexler, 35-38). Just as genes compete, replicate, copy then deviate from each other, so do memes. How the ‘hard wiring’ of the neurological brain and its genetic codings process memes will underline the work of this century. Yet the frontiers of medical research will provide us with many cutting edge examples. The goal of medical technology is to find ways of making synthetic units to heal damaged tissue and genes. When the healing process has consequences for meme pool, our relationship to creativity and identity becomes transformed.

Both *The Fountain*, *The Neuromancer* and *Brain Plague* examine how drugs, brains enmeshed in a virtual matrix, and humans soaring on the wings of scientific and mythical imagination, are all propelled by the memes in our heritage machines. Both science fiction novels critique how our memes rely on the history of medicine, and suggest how creativity will miscode or misread medical interventions. According to Dawkins, it is the competition and collisions between different memes, the way in which one ‘incorrectly’ imitates and replicates another that evolution (or devolution, according to some) takes place. *The Fountain* offers a historical critique of how memes travel, suggesting that the Tree of Life is the meme tree, the drug which will always be sought and which, in turn, will find new mimetic forms in new parts of the universe.

In the climax to *The Neuromancer*, the coded, molecular level of information, that is the meme, makes the apparently cybernetic Case unavoidably human.

His [Case] vision crawled with ghost hieroglyphs, translucent lines of symbols arranging themselves against the neutral backdrop of the bunker wall. He looked at the backs of his hands, saw faint neo molecules crawling beneath the skin, ordered by the unknowable code (1984, p. 241).

The ghosts produce a physiological effect, as though Case is in the lure of a drug. Thus, the shifting, nanotechnological interactions below the surface of the skin, which suggest a primeval stirring in the undergrowth, act medicinally and unpleasantly. The ‘ghost’ and the ‘hieroglyphs’ conjure ancient knowledge, and make its particles capable of tracking Case’s bloodstream. The memes of ancient and primeval times meet those of our futurity. Indeed, creativity, from the evolutionary point of view, is linked to dissemination of memes, which will not dispense with the human body as a medical entity or, in contrast to evolutionary theory, as that set of codes which is constantly re-written by environmental factors: a technology that feeds on the unpredictable edges between health and sickness.

In *Brain Plague*, the microbes debate questions of theology and creativity on a platform along brain capillaries. Revolutionary microbes worship lesser gods or none at all. One microbe, Rose, reminded me of a religious Quaker. So often, she turns within for inspiration. The old cliché that artists in a creative struggle need to “go inside and ask the big questions” is not a decision Chrysoberyl needs to make. The life and death of microbe nations, cultural inheritances, religious and technological revolutions at the monadological level, permit Chry no sleep. In the cities of Chry’s mind, the meme-like microbes develop their fields of knowledge at alarming rates. One microbe - Saf, ironically, less than safe - learns how to build the first microbe space-ship. While the miniature populations can be transported from one human host to another through injections, the space ship is a sign of the meme’s ability to make a giant, and above all, self-motivated leap for ‘meme kind.’ Its quest for outer space is both religious yet infectious. In the wrong mixtures, these disease protecting microbes can themselves become the disease. Hence, this comical aspect of *Brain Plague* uses the miniature narrative of microbe evolutionary leaps, to bring together three discourses – that of creativity, memes, theology and the spread of disease.

In the films and novels which have been the focus of my analyses, their intimations of posthumanity are not fantasies based on fanciful expectations about the future of neural programming or nanotechnology. The cybernetic system of *The Neuromancer* conceives of a metaphorical and exaggerated version of the Internet, which is not the Internet itself. When Neuromancer appears as a boy doing somersaults in the cyber system, he explains to Case that

stating and calling the correct computer codes is the equivalent of raising demons. Tom in his incarnation as a Space Traveler, also performs a particular form of magic. Indeed, this Traveler's acts of 'magical thinking' do achieve results. He thinks positively and strongly enough about his desires and his images become reality. He practices a great deal of meditation and turns himself into the calligraphy covered image of a tree. His mental determination is so great, that synaptically speaking, his brain cells connect to the quantum field. No doubt he will discover new ideas, or memes, to solve the problems of brain tumors. The micro-cells, the micro-gravities and the miniature memes, are all techno-mystical angels that re-code the larger structures of mind and universe.

Neuromancer has given us advice about interpreting works of science fiction in an age of neural pharmacology. Neuromancer gives us a code for reading, with and against the grain of science. Science fiction conjures untested moral, ethical and creative ciphers in technologies full of untapped diamonds and angels. Neuromancer warns us that no biomedical intervention can provide an innocent panacea. What makes the new biomedical interventions intimidating is that our humanness and its unpredictability show no signs of disappearing. Humans seize hold of one intention only to pervert it into another. They do so in an attempt to escape from the human into the posthuman, from Tom the helpless neuroscientist into a Space Traveler who will have love which lasts for eternity. We are our own angels and we make our own nanotech wings. And as science fiction warns us, there are few places where these 'nano' angels will fear to tread.

Bibliography

Clarke, Arthur C. "Third law," *Profiles of the Future: an Inquiry into the Limits of the Possible*. London: Henry and Holt Company, 1984.

Benjamin, Walter. "The Work of Art in the Age of Mechanical Reproduction." *Illuminations*, Ed. Arendt, Hannah, New York: Schocken Books, 1984. 217-252.

Brinton, Roberta Diaz. "A Chip on Her Shoulder," [Online] *Networker@ USA*. Sep/October, 1999.

Cavalcanti, Adriano, Shirinzadeh. Bjan, Fukada, Toshio, Ikeda, Seiichi. "Nanorobot for Brain Aneurysm." *The International Journal for Robotics Research*. April 2009.

Csikszentmihalyi, Mihaly. *Creativity: Flow and the Psychology of Discovery and Invention*. London: Harper Collins, 1996.

Dawkins, Richard. *The Selfish Gene*, Oxford: OUP, 1978.

- Deleuze, Gilles and Felix Guattari. "Becoming Intense, Becoming Animal, Becoming Imperceptible..." *A Thousand Plateaus: Capitalism and Schizophrenia*. University of Minnesota Press: Minneapolis, 1987: 232-310.
- Deleuze, Gilles. *The Time-Image: Cinema 2*. Trans. Hugh Tomlinson and Robert Galeta. The Athlone Press: Minneapolis. 1989.
- Doidge, Norman. "Brain Lock, Unlocked: Using Plasticity to Stop Worries, Obsessions, Compulsions, and Bad Habits." *The Brain that Changes itself: Stories of Personal Triumph from the Frontiers of Brain Science*. London: Penguin, 2007. 164-167.
- Doidge, Norman. *The Brain that Changes itself*. "How Thinking Makes it So." 196-215.
- Drexler, K. Eric. *Engines of Creation: The Coming Era of Nanotechnology*, New York: Anchor Books.
- Fromm, Harold. "Muses, Spooks, Neurons, and the Rhetoric of 'Freedom'." *New Literary History*. 2005, 36: 147-159.
- Gibson, William. *The Neuromancer*. New York: Ace Books, 1984.
- Gilbert, Elizabeth. 2006. *Eat, Pray, Love: One Woman's Search for Everything Across Italy, India, Indonesia*. Penguin: London, 2007.
- Gilbert, Elizabeth. "On Nurturing Creativity." Ted.com, February 2009.
- Hales, Katherine N. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. The University of Chicago Press: Chicago and London,
- Pisters, Patricia. "Mathematics, Madness and Metaphysics: Two Poles of the Neuro-Image in *PI* and *The Fountain*. *Deleuze and the Forces of the Virtual*. University of Minnesota Press: Minneapolis, Jan 2010. In press.
- Plato, *The Republic*. Hackett Publishing: London, 1992.
- Slonczewski, Joan. *Brain Plague*. New York: A Tor Book, 2000.
- Woody, J. Melvin and James Phillips. "Freud's 'Project for a Scientific Psychology' after 100 Years: The Unconscious Mind in the Era of Cognitive Neuroscience." *Philosophy, Psychiatry and Psychology*. Vol. 2, No. 2. June 1995.

Filmography

- Aronofsky, Darren. *The Fountain*. Warner Bros. 2006.
- Aronofsky, Darren. *PI*. Harvest Filmworks. 1998.
- Wachowski Andy and Larry. *The Matrix*. Warner Bros. 1999.