Introduction

The Secret Fire

At the start of the new millennium humanity is embedded in a rapidly burgeoning technological culture. In the emerging globally networked village our bodies are intertwined as never before with increasingly dynamic flows of capital, goods, immigrants, pollution, software, refugees, pop culture, viruses, weapons, ideas and drugs. This hybrid age of rapid technological progress, as I will argue, is characterised by a radically intensive blurring of boundaries – not only between different peoples, plants, animals, micro-organisms, medicines, genes, memes and traditions, but also and especially between humans and their machines.

Contemporary technologically advanced societies appear to have actualized magic. Humans living in these cultures can fly, communicate instantly, cure ailments, create and harness energies (such as electrical and radioactive energies), and produce sounds and artistry that their ancestors could only have imagined. This places all of humanity at a treacherous crossroads where different future trajectories, some ruinous, intersect. Technological progress could result in unprecedented ecological disasters or any number of catastrophic scenarios. There are, however, hallucinatory maps that circumnavigate these cataclysms and point the way to strange imagined futures. One such map at the hybrid crossroads of science, myth and magic, one I have termed the *techno-genetrix* (namely, generative, nurturing, or womb-like technology), seeks to obliterate distinctions between humans and machines, nature and culture, primitive and modern as it plots a way into the future. This map covers the marginalised literary discourse of science fiction, informs cultural historians such as Manuel De Landa, fuels the conversations of media critics such as Marshall McLuhan and Erik Davis, appears on the radar-screens of contemporary theorists such as Sadie Plant and Deleuze and Guattari, and invigorates the dreams of ethnobotanists and

future-gazers such as Terence McKenna. The works of these individuals are interwoven with my discussion.

Tracing the roots of technology down into an imagined past, the *techno-genetrix* leads to the ancient figure of the shaman, an intermediary between the organic world of nature and the artificial realm of culture. Having journeyed into the past, it also races ahead into possible futures, re-invoking the shaman and transforming him or her into a science-fictional human-machine hybrid - a cyborg. It is on this cultural wildcard, a hybrid fusion of past and future, sacred and profane, natural and artificial, that the *techno-genetrix* pins all hope.

"We're talking seriously mutated worlds that never existed on this planet before … and it's not just ideas - it's the *new flesh"*, proclaims Donna Haraway (in Kunzro 1997:1), whose seminal *Cyborg Manifesto* (1991) describes "a set of systematic relations [between humans and machines] in postmodern high-tech culture" (Csicseray-Ronay 1991:396). Humans are no longer "natural", states Haraway; our use of machines and biotechnologies are transforming us into hybrid beings or cyborgs. As a theoretical construction, the cyborg represents a science-fictional "form of discourse that that directly engages postmodern language and culture" (Csicseray-Ronay 1991:388). As an image of humanity, the cyborg is "an elementary aspect of late capitalism", nimble fingered women working 12-hour shifts on machines in Malaysian sweatshops, workers glued to computers and cell-phones, and housewives operating their dishwashers and automatic top-loaders (Haraway 1991:161).

According to Haraway's theory, the use of tools and machines has set in motion a transmogrification of the human species. "Part of the world's population is already post-human", concurs critic Mark Dery, "the future has already happened" (1992:102).[i]

The proliferation of communication technologies seems to be ushering in a new, social fabric. Territories of "production, reproduction and imagination" are all at stake in the "border war" between organism and machine, argues Haraway, adding, "all who would remain in control of their bodies … [must] come to terms with the essentially cyborgian nature of lived reality in a technoculture" (Haraway 1991:161).

Facing up to the dialectic of the machine-as-us is, following Haraway, however, no simple philosophical feat. Complex new body politics, the networks of information exchange, and the micro-political power-struggles between the technocratic elite and the information-poor masses all conflate and add to a brimming sense of technological unease. Fed on a steady diet of televised and billboarded media-bytes, our sense of historical time and ways of comprehending the external world seem to be dissolving into an electronic buzz. "We are abandoning ourselves to an "ecstasy of communication … a cold and schizophrenic fascination with a gluttony of information," deliberates French postmodernist Jean Baudrillard in a bleak observation (in Davis 1998:278).

Despite the seemingly sterile nature of our interaction with contemporary media machineries, all may not be lost to the so-called "infoglut". Baudrillard's mind-numbing ecstasy may perhaps be coaxed into facilitating a vital non-linear ontology. Part of our cyborgian adaptation, muses critic Erik Davis, "may actually involve moving the ecstasy of communication to a higher ground, where we might grab this [potentially] visionary bull by the horns" (1998:279). In our techno-confused world, no figure could be better suited to the task of gaining a new technological *terra-infirma* than the ancient arbiter of the sacred and master (and mistress) of communicative ecstasy, the shaman.

The hybrid and science-fictional intersection between the cyborg, the new flesh of posthumanism, and the mythos of the techno-genetrix has its origin in the ecstatic transformations of the alchemists and the shamans. Any map that would therefore attempt to plot a course through the contemporary technological landscape cannot fail to register the importance of fire to human cultural imagination. "Fire is the fundamental and most basic example of man's harnessing of natural forces that led to technology proper – modern technology is a fire-based technology", avers Carrol Brown, linking the fire-magic for which archaic shamans are renowned (see Halifax 1982:88-89) with the Promethean myth that underlies the origins of the machine (1993:167-68). "The Greeks deferred fire, the first support of all human [technological] culture, to the world-transcending deed of their Prometheus", writes Joseph Campbell (1993:35). As with any archaic shaman, whose journey, according to Eliade, is one of ascent into the heavens or descent into the underworld (1989:180), "Prometheus ascended to the heavens, stole fire from the gods, and descended" to teach humans the fiery arts (Campbell 1993:30). Contemporary alchemical scholar John Opsopaus avers that the deeds of Prometheus have a chthonic counterpart in the ancient Greek mystery traditions that tell of a sacred and generative fire in the bowels of a living earth (1999:1). The idea of obtaining the secrets of invention and generation from the fiery coils of the Earth's womb is central to the craft of alchemy, a magical/technological hybrid art that lies between archaic shamanism and modern science. "Like the ancient shamans the alchemists connect the Earth to the Sun, descent to ascent", writes Opsopaus (1999:1). "For alchemists, the fire that comes from the centre of the Earth is also the key to the process of transformation and transmutation" (1999:1). Thus, the "innate heat of the womb of nature" empowers "transcendence through experimentation and innovation" (Opsopaus 1999:1).

> The Earth is the Mother of the Elements; from the Earth they proceed, to the Earth they proceed, to the Earth they return. Make the Earth light, and give weight to the Fire, if you would meet what is rarely met. (De Rola 1973:17)

In the course of a research expedition to Sicily in 1638, the great alchemist Pater Athanasius Kircher had himself lowered into the crater of Vesuvius (Roob 2001:178). There, perched on a rock above a live volcano, he was able to see for himself the workings of the Earth's creative inner fire and gain insight into the Earth's inherent technological processes. As the light of the "secret sun radiating at the Earth's centre" spilled forth, Kircher was accorded an excellent view of "a fiery subterranean workshop", a spectacle that reinforced his alchemical conviction that the Earth was a "physical creature" with a drive for technological creation (2001:178-79). For Kircher and other alchemists, volcanoes represented safety valves whereby a living and strangely industrious earth let off steam via a subterranean network of lava canals. Seas, in turn, were seen by certain alchemists to represent a vast cooling system that calmed the heat radiating from the Earth's inner furnace, enabling life to flourish in the moist heat of the atmosphere (2001:179). Another student of alchemy, Goethe, echoed Kircher in describing the earth as "a great living creature, constantly breathing in and out … like the bellows of a giant forge" that constantly generated and coalesced an array of organic and inorganic life forms both within its bowels and on its surface (2001:179).

Places of volcanic activity, such as Vesuvius, did not hold fascination only for the alchemists. Ancient Greek and Chaldean myths held that these fiery furnace-mouths were the birthplaces of a race of smiths[ii] who, in an age long past, instructed humans in the art of metal craft and civilisation (Opsopaus 1999:1). Delivered from the "enwrapping fire" or membrane (*hymên*) of the Earth goddess, the smiths (known as the Daktuloi, Telkhines and the Kabeiroi), were depicted as

the “brandishers of lightning bolts and sparks” who taught early civilizations the secrets of fire (Opsopaus 1999:1).

Themselves described as the “gnome-like midwives of metals” by Mircea Eliade, alchemists drew direct inspiration from the magical crafting of metals undertaken by the smiths of Greek and Chaldean myth (Opsopaus 1999:1). Legend tells that when the Greek mystical mathematician and alchemical forbear, Pythagoras, overheard the sounds of hammers pounding in a smith’s forge, he realized that tones could be expressed in quantitative relationships, and hence in numerical values and geometrical measures (Roob 2001:90). This insight of the world as harmony, number, and vibration not only formed the metaphysical basis of mathematics and engineering, but also inspired the alchemical notion of the *Harmonices Mundi*, the music of the spheres (Roob 2001:90-91). This sacred music, derived from the sounds of a forge, represented the harnessing of the earth’s secret fire by human science. But deeper still in the alchemical imagination, the roar of hammers beating on anvils and the thunder of volcanoes erupting were interchangeable. Smiths and volcanoes alike reflected the sacred rhythms of the *Harmonices Mundi*, the murmuring of a dreaming Earth, the linking of heaven and Earth through sound, which anchored of humanity to the energies of an inherently creative and technological planet.

In the cover illustration for *Musurgia Universalis* (1650), Kircher portrays the Pythagoras of alchemical legend seated beneath a glowing orb representing the *Harmonices Mundi* (in Roob 2001:90). Instead of pointing upward towards the celestial orb, Pythagoras is depicted pointing downward towards a crater-like opening in the Earth that reveals a womb-like cave where smiths are hammering in a sweltering forge (Roob 2001:90). By pointing down toward the furnace-womb that inspired the *Harmonices Mundi*, Kircher’s Pythagoras is gesturing towards to the “great work of alchemy” that draws its life-blood from the furnace beneath the

Earth (2001:90). “Visit the interior of the Earth and through rectification (repeated distillation and experimentation) you will find what is hidden”, reads the inscription on Von Stolcenburg’s alchemical magnum opus, *Viridiarum Chymicum* (1624), referring to the alchemist’s quest to glean secret knowledge from the Earth’s inner fire (in Roob 2001:189). By incubating the earth’s “developing embryos” (namely, metals, minerals and ores), the alchemists “imagine the process of transmutation as a kind of fermentation, in which certain metals are able to transfer their properties [those pertaining to the secret inner fire] like an enzyme or a yeast to the work of the alchemist” (Roob 2001:23).

> In the subterranean bowels of Mother Earth, the base metals mature towards their perfection. The caves, mines or metal pits are also seen as the womb. In the place of it [the Earth’s ‘womb’ and the artificial ‘womb’ of the mines], we the philosophers [namely, the alchemists] use a wide glass, [the alchemical oven or *athanor*] which is also called the Earth’s egg, to hasten the process. (Roob 2001:183)

Sacred caves and subterranean networks are the places of choice for many kinds of mythical and magical cultural incubation. The earth as a generative or womb-like force is present in a Hebrew tradition, which holds that Abraham was born in the bowels of the Earth and that the Earth itself was his mother and father. “The Bible gives the name of Abraham's father as *Terah*, a cognate of Terra, 'Mother Earth' whose womb was usually a cave”, writes Barbera Walker (in Adams 2002:1). “In the Middle East, many gods were born in womb-caves”, she continues. “Like Abraham, the Persian savior Mithra was born from of a rock, the *petra genetrix*, in a magic cave deep below the earth. The place of Jesus' birth, too, was originally a cave” (in Adams 2002:1).

The Persian myth of the *petra genetrix*, or generative stone, is referred to by sf critic Sharona Ben-Tov in *The Artificial Paradise* (1995), an interrogation of the alchemical foundations of modern techno-science. For Ben-Tov, the hermetic (namely, the alchemical) notion that metals and minerals mined from the womb of

the earth could aid alchemists in their mediation of the earth's generative and life-giving processes represents an appropriation of the myth of the *petra-genetrix* (Ben-Tov 1995:93). "Heating ores in ovens," writes Ben-Tov, "the alchemists and the smiths speeded up nature's generative process, bringing her embryos (metals) to maturity in an artificial womb" (Ben-Tov 1995:93).

Smiths, working in the artificial womb of the forge, were not the only predecessors of the fire-loving alchemists who set about harnessing the properties of a generative earth. Even before the *petra-genetrix* animated the experiments of the alchemists and their scientific successors, pre-historical peoples had already formulated mythical systems that resonated with this idea. From the first discovery of pottery, tool-making and metalcraft, the boundary-blurring shaman figure of archaic pre-historical culture was ostensibly situated within the mythos of a generative earth (Abraham 1992:98). Moreover, like alchemists and smiths, shamans are understood to have played a role in the generation of human technology and culture.

> Shamanism begins with a kind of deep penetration into early metallurgy. In this process, the smith and the shaman are twin brothers linked together in the extraction of energy from matter. This 'whispering from the demon artificers', as Jung put it, has led us into technological self-expression, and even self-expression *per se.* (Abraham 1992:98)

In societies (both archaic and contemporary) where shamanism is prevalent, the shaman and smith, according to Ralph Abrahams (1992:98), are regarded as an "interventional obstetricians [or midwives]", whose role it is to hasten the creative evolution of human culture by harnessing the Earth's secret fire in melting and shaping metals, clays and minerals (1992:98). In *Shamanism: Archaic Techniques of Ecstasy* (1989), Mircea Eliade relates a Yakut proverb: "smiths and shamans are of the same nest" (1989:470). Listing the commonality of smiths and shamans in archaic cultures (1989:470-74), Eliade remarks, "like the smiths, the shamans are 'masters over fire' although their magical powers are notably greater" (1989:472).

Described by Eliade as “specialized technicians” (1989:23) whose cultural roles include the “transmission and perfection of speculative thought” (1989:31), shamans exceed smiths in their range of action. Whereas the function of smiths is restricted to metallurgy, the shaman’s vocation embraces the “manipulation of matter”, through a deep and profound understanding of the earth’s mysteries (1989:32). Shamans, furthermore, are technicians who “incarnate and transform” the sacred and secret properties of trees, stones, metals, minerals and nature itself (1989:32). Through the use of ecstatic techniques shamans facilitate a direct merging with the non-human vegetable and mineral realms. Defined by their boundary-blurring activities, shamans can be seen as visionaries whose activities allow them constantly to transcend the barriers of language and culture in their search for new modes of expression and embodiment.

Like the alchemists, the shaman’s mastery of fire involves both descent and turning inwards. Instead of utilising an alchemical oven to transmute ores and minerals, the shaman literally burns from within. Eliade records numerous techniques for engendering shamanic fire magic or magical heat, such as bodily deprivation, rhythmic chanting, drumming and dancing, in *Shamanism: Archaic Techniques of Ecstasy* (1989). Following Gordon and Valentina Wasson (the founders of ethnomycology), enthobotanist Terence McKenna claims in his seminal *Food of the Gods* (1992) that Eliade overlooked one of the fundamental agents of ecstatic boundary dissolution, namely the use of hallucinogens. Hallucinogens are the primary agents of magical heat and form the cornerstones of the shaman’s fire magic, avers McKenna (1992:61): “it is the presence of the hallucinogen which indicates that shamanism is authentic and alive”.

The boundary dissolutions brought about by the use of hallucinogens and other techniques of ecstasy constitute, for French post-structuralists Deleuze and Guattari, an example of the shaman’s tapping into and transversing of a “higher

disorder" of nature. The shaman's participation in the world, they argue, is an "unnatural participation" (1988:242). Like the alchemist who physically lowered himself into a volcano in order to observe the workings of the earth's furnace, the shaman, through engendering magical heat, lowers him/herself into the furnace of his own embodied being, bringing about a new ecstatic awareness that exceeds the cognitive and spiritual by incorporating a material nexus. Furthermore, through boundary dissolution and sensory extremity, the shaman is able to realize that "the only way nature operates [is] against itself" (Deleuze and Guattari 1988:242). This implies that the shaman gains insight into nature by facilitating states of mind and body that are treacherous and extreme. Moreover, it implies that potentially hazardous human endeavours, such as technology may, like hurricanes and tsunamis, actually form part of the "natural world" and its cycles. For Deleuze and Gauttari the distinction between nature and culture is, in any event, redundant (1988:242). Only shamen and other "unnatural participants" (such as cyborgs), they argue, are able to perceive this concord and engender new and potentially less devastating technological conceptions.

The fiery descent of the alchemists and the fiery ecstasy of the shaman both represent attempts to construct new technological insights at the boundaries of human meaning and value. Their emphasis on gestation by means of a secret inner fire situates technology not only within the human body, but also within the body of the earth itself (an aspect that will be fully explored in chapter 1). Both the shamans and the alchemists seek to harness further the properties of a generative earth in order to facilitate transformations and construct radical new ontologies.

Shamans may have much to teach us about technology and about healing our disintegrated sense of self and environment. Possessed of an ability to "transcend time and space", overcome dualities, merge with other life forms or abstract/non-

physical entities and rise above the “profane human condition”, the shaman is able to “to restore the ‘communicability’ that was in place before the onset of history” (Eliade 1989:171). Such a voyage back in time is an unlikely place to meet the shaman’s counterpart, the cyborg, itself an agent of the fiery crafts, namely, “transgressed boundaries, potent fusions and dangerous possibilities” (Haraway 1991:154). Like shamans, cyborgs are involved in the formation of a new articulation, a new discourse, “a new kind of language … a narrative of permanent possibility”, writes Anne Kull (2002:285). This possibility is inclusive as the cyborg insists on a deep and profound connection with the world of animals as well as with the many worlds of all non-human others (Kull 2002:281). The cyborg and the shaman both understand that “our relationship with nature is the correlate to our relationship with ourselves” (2002:282).

The title of my work, the *techno-genetrix*, implies that technology has now come to occupy the same cultural role originally occupied by a generative nature in the realms of alchemy and archaic shamanism. This involves a reading of technology as a “natural” force that is self-organising and inextricably woven into the fabric of humanity, utilising humans to play obstetrician to its very own process of creation. As a theme, it suggests that technology is a natural[iii] phenomenon, whose budding self-generative properties are currently giving rise to a growing sense of instability and disintegration, the effects of which can be traced in the literary genre of science fiction (sf), theoretical discourse, scientific speculation, futurology, and a broad range of fields that are involved in imagining the potent nexus of biology and technology. In the same iteration, cyborgs are taken as signifying “hybrids of machine and organism” (Haraway 1991:150) and shamanism as suggesting a process of boundary-blurring amalgamation that entails dismemberment, disintegration, reformulation, hallucination, and all manner of sensory overlaps and boundary confusions.

Virtual interfaces, as the language of the shaman and the cyborg, are taken to denote the symbolic imaginary utilised by both the cyborg and the archaic shaman in their roles as technological midwives or incubators of new alliances between technology and nature in the post-modern cultural imagination. This symbolic imagery utilised by Haraway in her formulation of a cyborg ontology denotes interpenetrations between humans and machines, between culture and nature, between selves and others. Bringing into being "parallel spaces, zones, or narrative spaces where language, rationality, and subjectivity break down" (Gordon 1995:444), sf and the speculative writings of contemporary theorists can be seen as virtual interfaces that allow for "a provisional re-embodiment of the human subject" (Gordon 1995:444). In this re-embodiment, the figure of the shaman as a fiery agent of boundary dissolution serves, in my estimation, as a valuable metaphor to shift the potentially sterile and dangerous nature of human interaction with contemporary technologies to a healthier and more integrated ground.

The science-fictional conceptualisation of new bodies that incorporate technological processes can be seen as an attempt to formulate, not only a new discourse, but also a new conception of the material universe. The "new flesh"[iv] represents the potent and embodied (not merely abstract or imaginary) integration of humans and machines, a new embodied cyborg consciousness that is emerging at the nexus of biology and technology. The new flesh, as articulated in the hybrid apocalyptic fictions of William Burroughs and David Cronenburg (Miller 1999:12), points, like Kircher's Pythagoras, downward into a foment of panic and technological unease that lies brimming within the contemporary technological debate. This sense of spectral unease finds articulation in Holdstock's *Mythago* cycle. Simultaneously, the metaphor of the new flesh seems to imply a potential shamanic rebirth through panic and catastrophe, a symbolic fiery death, disintegration, and renewal that allows for the emergence of a new and radically

altered ontology. This metaphor of renewal through catastrophe is presented in the works of Kathleen Ann Goonan and David Zindell.

In exploring the boundary-blurring effects of the *techno-genetrix*, I will provide detailed analyses of specific examples from contemporary science fiction that investigate the construction of new human bodies as well as new metaphorical vehicles with which to navigate through new terrains, technologies and augmented senses. These are Robert Holdstock's *Mythago* cycle (1986-1991), David Zindell's *Requiem* series (1994-1999), and Kathleen Ann Goonan's *Nanotech* trilogy, consisting of *Queen City Jazz* (1998), *Crescent City Rhapsody* (2000), and *Light Music* (2002). Texts that share some features of science fiction yet fall under the mantles of postmodernism, quantum physics, computer-science, information theory, anthropology, ethno-botany, and media theory are also utilised as sources, and often read as if they were examples of sf. Such a merger and confusion between a variety of contemporary discourses and sf is by no means new: "today many contemporary critics, such as Scott Bukatman, consider sf in the broadest sense, encompassing not only literature but also a variety of other media", writes Andrew Gordon (1993:445). Sf is a discursive practice that integrates literary, philosophical, and scientific imaginations whilst "subverting the cultural boundaries between them", concurs Istvan Csicsery-Ronay (1991:388), arguing that sf should no longer be considered as a specific "genre of literary entertainment, but [rather] as a mode of awareness" that includes cultural theory and scientific speculation (1991:388). "The surreal sf of authors such as Phillip K. Dick and the bizarre, hyperbolic ravings of critics such as Baudrillard" are analogous, writes Gordon (1993:445). "Both are visionary writers attempting to create metaphors adequate to a new reality" (1993:445).

In chapter 1, specific areas of focus include an articulation of the emergence of a new and arguably shamanic awareness of technological processes occurring at the

nexus of fiction and theory as well as new emerging definitions of technology that no longer distinguish between the "natural" and the "artificial." Although this exploration groups a variety of texts together under the broad header of sf, they are all unified in their hybrid and cyborgian distortion of genres and signs under the banner of technology.

Thereafter, Robert Holdstock's *Mythago* cycle (chapter 2), David Zindell's *Requiem* series (chapter 3), and Kathleen Ann Goonan's *Nanotech* trilogy (chapter 4) will be critically investigated for their specific (and often divergent) treatment of cyborg and shaman bodies and modes of consciousness. Each of these works has been chosen because of their compelling exploration of transformation and boundary dissolution, their utilisation of the metaphors of shamanism, as well as for their powerful articulation of new hybrid modes of awareness and embodiment. These texts will be explored throughout the following chapters in the light of critical theories, scientific speculations, and allegorical fantasies that are, in themselves, examples of the science-fictional imaginary. Each of the writers whose works I have chosen to analyse form part of a burgeoning collective of writers, critics, theorists, and mystics whose writings are beginning to re-explore and re-articulate the potent nexus between the natural world and the "made" world of human artifice. This nexus, as I have demonstrated by referring to alchemy (in this introduction) and shamanism (throughout this work), spans millennia and different cultural perceptions of the world, uniting past, present, and future in a heady amalgamation that defies boundaries and resists definition.

In surveying the self-generative properties of technology, the shaman *as* cyborg will be always at hand to mediate in the rise of ever-new metaphors and modes of perception as well as to aid in the fusion of apparently categorical oppositions. Throughout the exploration that will follow, which is in itself a science-fictional and theoretical fantasy, the cyborg as the shamaniser of the new flesh will act as

guide and destabilised agent of the dismemberment and re-construction of cultural and bodily fleshiness.

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[i] For Dery, the cyborg is the ultimate expression of post-modernity, a hybrid monster that permeates technocultural discourse. As a signification of "biology morphed by technology … its physiology reconciles technoculture and nature, dystopia and arcadia, simulacrum and original" (1992:101). Dery, however, restricts his contemporary examples of cyborgs to the mechanisms of Hollywood (for example, in the *Terminator* and *Alien* movies) as well as to the privileged rich who can afford plastic surgery and organ transplants. Haraway, on the other hand, locates her cyborgs in every walk of life – from export processing and free-trade zones where the globalised poor slave on assembly-lines to financial districts where stock traders and magnates speculate on the abstract electronic movements of capital. This "cyborg mutation" is the ideology of modern production, she notes, it is an "elementary fact of late-capitalism" (1991:162).

[ii] The link between magic and technology is fully articulated in chapter 1, and frequently referred to in subsequent chapters. Numerous books and articles that refer to the innumerable relationships and correspondences between magic and technology will be cited throughout this text. Books that are wholly dedicated to exploring this nexus include Erik Davis's *TechGnosis* (1998) and Richard Stiver's *Technology as Magic: The Triumph of the Irrational* (2001). Articles include Chris Cheser's *Why the Digital Computer is Dead* (2002). Davis, Stivers and Cheser are unified in their deconstruction of the magic/science opposition. For the purposes of the introduction, it suffices to mention that the meticulous and rigorous experimentation of the alchemists on metals and minerals as well as their various combinations is the direct, albeit unacknowledged, forbear of modern chemistry and physics (Roob 2001:28-34). Alexander Roob refers to modern particle physics as "practical alchemy" and writes: "the nonalchemystical atomists of the 20th century finally realized the alchemical dream of transmuting the elements 200 years after the refutation of all scientific foundations in the hermetic arts" (2001:32).

[iii] "Life [read: nature] should be seen as occupying the same sphere as that of technology, and not as standing in opposition to it," writes Didier Deleule (in Crary 1992:206). Cultural historian Manuel De Landa expands on this concept by observing that so-called machines often arise spontaneously in nature (De Landa 1991:117-121). He avers, moreover, that not only do these *natural machines* (such as insect colonies, rivers, chemical clocks, etc.) obey the same laws as artificial machines, they prefigure human technologies in their ability to self-evolve and assume intelligent/heuristic behaviour: "The biosphere, as we have seen is pregnant with singularities that spontaneously give rise to [machinic] processes of self-organisation. Similarly, the portion of the mechanosphere constituted by machines and computer networks, once it has crossed a certain critical point of connectivity, begins to be inhabited by the same symmetry-breaking singularities, which give rise to emergent and intelligent properties in [natural] systems" (De Landa 1991:117-121)

[iv] See Barbara Miller [1999:6-13] for a full exploration of the meaning of the term "new flesh".