

Chapter 4

The Epiphenomenon of Fluid Transmissions

Organisms and their assemblages are the most complex systems known. They are also self-assembling and adaptive. Living systems in general, by constructing themselves molecule to cell to organism to ecosystem, surely display whatever deep laws of complexity and emergence lie within our reach. (Wilson 1998: 95)

For better or worse, the greatest technological breakthrough in history is still to come. ... The new technology will handle individual atoms and molecules with control and precision; call it molecular technology or nanotechnology. ... It will [eventually] be self-assembling and adaptive, changing our world in more ways we can imagine. (Drexler 1986:4-5)

Kathleen Ann Goonan's trilogy, comprising *Queen City Jazz* (1998), *Crescent City Rhapsody* (2000), and *Light Music* (2002), charts the chimeric transformation of humanity through technology. Set in a near future awash with genetic engineering and nanotechnology, her vision relies on elements of music, dance, story-telling and archaic ritual as it seeks out "a [new] science buttressed by emotion" (Goonan 1996:31). Like Zindell, Goonan invokes a novel synthesis, combining technological interfaces and scientific speculation with affective material bodies, organic networks and ecstatic transformations. Her surrealistic vision of the future balances the old and the new, acknowledging that the humans of the future will be "standing on the backs of those who went before as surely as we stand on the backs of those who sketched bison in the caves" (1996:33). Exploring what Deleuze and Guattari have termed "creative involution" (or "nature operating against itself" in order to facilitate new developments [Deleuze and Guattari 1988:242]), Goonan's future of emergent artificial intelligence, self-evolving DNA-based technologies and mutating humanity is a perverse cyborg world that flickers mirage-like on the edges of the cultural imagination, beckoning from the next technological development. Simultaneously, like the twisted and anguished mythic worlds of Holdstock's forest, Goonan's transformed world is the reflection of an incendiary and fragile present. Haunted by myths of apocalypse and

transcendence, Goonan's vision of runaway technology heralds the birth of the new flesh that emerges from catastrophe.

The technological framework within which Goonan's future humanity is enmeshed is invisible, soft and wet (that is, fleshy and alive). Merging ideas of disembodied transcendence through technology with notions of shamanic transcendence achieved through bodily ecstasy, Goonan's imagined future of "wet" networks and miniaturised DNA-machines presents a vision of the human body overrun and radically altered by a promiscuous host of biotechnologies, nanotechnologies and electromagnetic frequencies. Like the psychonauts of Holdstock's fiction and the lighship pilots of Zindell's distant future, Goonan's "cyborged" future humans undergo strange transformations. Their world is a strangely twisted version of the present, where burgeoning networks of information exchange are plunging contemporary humans into a pervasive and perplexing data flow, an electronic gridwork, a second skin. This technological epidermis, as Goonan's humans discover, is nothing more than an energy flow nested within a larger planetary and universal matrix; an interconnected flow of enlivened matter that is being mapped and configured in the early twenty first century by electron microscopes, advanced telescopes, high-end computers, satellites and the perceptual possibilities that these devices have opened in the contemporary imagination. This new world is described by Orphan Drift:

Matter is the analogue skin of the universe. ... Digital technology is the simulating space that allows matter to manipulate itself in the smooth space of infinite configuration. Feel it ... the clusters in between human and inhuman as the body liquefies to amplify its experience. No dematerialisation here, rather a smearing. Spread out across planes of immanence, wired for tactile fusion. Pure signal, pure communication. We're hungry ghosts watching artificial life hatching a wasp-frenzy of replication multiplication inside us as intelligence dives into its own materiality. The howling of genetic matter ... out of control. (Orphan Drift 1995:64)

DNA-based technology, as Goonan argues, loosens humanity from the hardware of mechanized technological production and submerges us in a fluid transmission, a new articulation of an affective and sensual world that is at once virtual and completely embodied. Her world of rampant genetic engineering is a world without boundaries in which the feeling body (and not the mind) becomes the site of an intelligence that is both artificial and natural. The body and its complex chemical codes, as I will demonstrate by referring to Goonan's conception of wet technology, takes on the functions of the mind, the site of new senses and the host of strange new technological becomings. Similarly, as I will reveal, Goonan's *sf* succeeds in not only moving beyond Cartesian mind/body dualisms, but also in obliterating distinctions between humans and their machines as well between humans and their natural and constructed environments. Goonan's future world, in which machines are taking on a new and independent life, takes pleasure in being completely out of control. Her fiction articulates, like Haraway's cyborg narrative, a sense of pleasurable irony, contradiction, and ambiguity that merges constructions of good and evil, natural and artificial (Haraway 1991:151). Haraway explains:

Late twentieth-century [and early twenty-first-century] machines have made thoroughly ambiguous the difference between natural and artificial, mind and body, self-developing and externally designed, and many other distinctions that used to apply to organisms and machines. Our machines are disturbingly lively, and we ourselves frighteningly inert. (Haraway 1991:152)

Technology has never been neutral and our human bodies have never been quite 'natural', in any pure or edenic sense. At a molecular level human beings are seething networks of microscopic entities, whose continuous replications and infiltrations go beyond any preconceived notions of what it means to be pure or "natural". As the site (or the host) of numerous molecular beings (namely, bacteria, mitochondria and viruses) that all share in our DNA, our bodies exist in a biosphere laden with an invisible network of vegetable enzyme messengers and

molecular creatures that know no boundaries. "The body can no longer be seen as single or unitary ... we are all multiple beings", writes evolutionary biologist Dorion Sagan (in Plant 1998b:242). Infiltrated by bacteria, viruses, ideas and technologies, our bodies (and our minds) have always been contaminated by biological and ideological networks of exchange and control. Simultaneously, our notion of what it means to be human, even in a cultural sense, has arguably been in flux since we first picked up stone tools, painted caves, intoxicated ourselves, and tried to domesticate our environment. "We're inside of what we make, and it's inside of us", notes Donna Haraway (in Kunzro 1997:1), arguing that humans and their tools and technologically mediated environments are inseparably intertwined. Throughout history, the transversal relationship between tools, the environment, and human 'selves' has subtly (and sometimes radically) altered our ways of seeing and comprehending the world around and inside us. Today, human environments are mutating and evolving more radically under the influence of technology than ever before. Fed on the products of agribusiness (namely, chemically-enhanced and genetically-modified crops, hormonally enhanced animal meats, and irradiated foodstuffs), kept healthy (or damaged) by pharmaceutical products, and altered by medical procedures, immunisations and a constant barrage of artificial radiation, human beings are anything but untainted. "By the mid-1990s, more than fifty synthetic chemicals which disrupt the human endocrine system had been detected in products we use daily", writes Sadie Plant (1998b:216). Plastics that leak hormonally active chemicals, foods containing potentially toxic additives, and electronic or wireless devices channelling dangerous doses of electromagnetic radiation are only some of the everyday factors that are "changing who we become [and] altering our destinies" (1998:218). Encased in a technological epidermis, humans are faced with mutation, deviation, perceptual warping and innovation. Slipping across boundaries, we have already become cyborgs, "theorized and fabricated hybrids of machine and organism" (Haraway 1991:150).

In today's world the cyborg has become more than a metaphor for gauging shifts in the contemporary (post)human condition. "Human subjects and conceptual or material objects [cannot be] isolated from the dynamic, correlative, multipartite systems in which they appear", writes Francisco Tirado (in Bell 2001:153). Instead, the cyborg as concept and subject is a "becoming, or an event" (Bell 2001:153) that operates in a tangled, complex and fluid topography. The cyborg world of rapid-fire technological change is one that might "soon pass a point of no return, beyond which everything would be unimaginably changed", speculates Goonan (2000:6). Her world, like ours, is a "world aswirl in newness, in change even more time-compressed in the twentieth century" (1998:365). Living beyond fixed boundaries and clean simplicities, the world of the new millennium is already interfaced with a spreading network of technologies, commodities and stories about the experiences of the body infiltrated by new networks (both real and imagined). Science fiction writer Ursula Le Guin calls our stories, "immensely flexible technologies" that enable us to make sense of the world by organising wildly different experiences, cognitions and fantasies into radical new articulations and meanings (in Wright 1999:1). Like Haraway's cyborgs, our narratives of boundary dissolution describe us as shape-shifters at the edges of an apocalyptic moment of change, dancers at the verge of a cataract over which present time flows and dissolves into future time. Beyond the present lies the imaginary new flesh of sf, an evolutionary mutation, a "biological initiation ... a living calculus" (2002:390).

Goonan's sf provides "a glimpse of what it will be like when humans have been changed [by] an evolutionary leap" (2002:392). Hers is "a vision of matter poised on some new, exciting, and unknowable future" (1998:194); a future run amok with wet machines, that appears to take its cue from "a playfully perverse notion that is beginning to permeate current technocultural discourse – [namely,] biology morphed by technology" (Dery 1992:101). Like all cyborg tales, Goonan's

narratives draw on a hybrid mixture of theory and fiction, science and myth, folk narrative and socio-political commentary.ⁱ Describing the possible outcome of an imagined nanotechnological revolution, Goonan's sf evolves the notion of a wet internet, an interlinked communications and information network that no longer relies exclusively on external technological apparatus, but is, rather, internalized and invisible. Her future technology sees humans hooked "on a new system [that] changes the human body so that everything else would change" (1998:162). "Organic alternatives [and] nano-tech alternatives both combined [into] bionan" are networking her future humans and their world in new ways, eroding stable boundaries between the "made" and the "born" (2000:88). Utilising the language of primitive magic, Goonan's describes her new technology as "voudoun ... something that could wreak strange transformations" (2000:97).

Brought into being by self-replicating molecular "engines" that infect human nervous systems, neural networks and matter itself with a new intelligence, Goonan's "wet-net" spreads virus-like through the air and is transmitted through inhalation or touch. The imaginary world that she explores in *Queen City Jazz* (1998), *Crescent City Rhapsody* (2000) and *Light Music* (2002) is a "world [that] has undergone frightening paroxysms of replication surges, thought-viruses called the Information Wars, and the emergence of the BioCities" (1998:351). Some humans now have "receptors" that enable "pheromone [and] hormone communication" (2000:212) and their minds and bodies are absorbed into surreal "flower cities" (her imagined BioCities) where the buildings themselves are "alive", glowing with "interces".ⁱⁱ Not only individual buildings, but entire cities, are matured from "seeds" and described by Goonan as being 'enlivened' DNA-based systems that mimic plants; "grown environments" where nature and technology intertwine:

The city represented matter modelled on thought. ... The stamp of Enlivenment – form smooth yet lively, surfaces precise and convincing, yet shimmering ever so slightly, as if effervescing constantly into air – was on the buildings in front of her. Along the high speedy-looking columns stylized tulips about thirty feet high were slightly raised from the surface plane. Incorporated into the vertical lines of the buildings were thin bright lines, interces, which looked as if they might be liquid encased in some sort of membrane, rising to the top of the buildings. From high balustrades dangled thick green vines ... atop one ledge she saw three thick stalks with unopened buds. ... 'Touch please,' said a voice ... the surface was yielding, yet it was membranous, containing whatever was inside, warm and smooth beneath her hand. Small bubbles [of DNA-coded information] inside pulsed upward. Her hand tingled pleasantly. ... There was an enormous feeling of naturalness despite the fact that she knew that the entire city was created ... no, it was *grown*. (Goonan 1998:195-97)

Goonan's sf, reflects the organic or biological world in that there are no certainties or fixed outcomes. Her world of DNA-based technology is one that, like the natural world, is in a process of perpetual becoming and flux. The future she imagines is "all new, and completely unknown ... a new direction towards total novelty" (1998:419). Marking the birth of the new flesh, Goonan charts a course towards a climactic and almost biological change, the emergence of "something so novel as to be unforeseeable, so powerful that it might ... catapult humanity to an entirely different level" (2000:64). Like the cyberpunk of William Gibson and Bruce Sterling, Goonan's sf represents an attempt to graft biology onto technology, creating "a new human being that can exist within novel technological environments" (Gordon 1993:445).

The rise of posthuman thinking within a framework of disembodied information and the conceptualisation of human consciousness as possessing similarities with information "evokes terror by calling forth fears of our gradual dehumanization, the dissolution of the autonomous 'individual', and the conquest of humans by machines", writes Katherine Hayles (in Keating 2000:63). Goonan responds to this terror by conceptualising numerous radical possibilities for embodiment within the context of an imagined future technological framework.

In a few instances, her conceptualisation of the new flesh reaches beyond new

forms of matter and achieves a complete disembodied transcendence, becoming pure frequency, a part of the electromagnetic spectrum. Like Zindell's cyborg deities who are able to inhabit "electromagnetic waves" (Zindell 1991:153), subatomic particles (Zindell 1996:67) and "radio waves" (Zindell 1996:268), Goonan's luminous cyborgs are "changed at the atomic level [into] light things" (Goonan 2002:244), pure informational patterns, "gelid structures of seductive light" (Goonan 2000:81). Like Donna Haraway's mythical (both fictional and derived from ancient cultural narratives) cyborgs, these godlike light beings represent a utopian possibility beyond gender and class distinctions. They signify "the simultaneity of breakdowns that crack the matrices of domination and open geometric possibilities" into novel forms of becoming (Haraway 1991:174). Like other science-fictional representations of the posthuman, Goonan and Zindell's light beings not only invoke terror in their erosion of the human form, but also "excite pleasure insofar as they are fecund with the possibility of radical political change" (Keating 2000:63).

Breaking the "boundary between physical and non-physical ... cyborgs are ether, quintessence ... [their] narrative concerns transgressed boundaries, potent fusions, and dangerous possibilities" (1991:153-54). This is not to say that the posthuman cyborg bodies of Goonan, Zindell and Haraway completely resist embodiment or privilege fantasies of onanistic mental virtuality. There are two sides to the posthuman condition, explains Katherine Hayles (in Foster 2001:628). "There is the nightmare of a culture inhabited by posthumans who regard their bodies as fashion accessories rather than the ground of being and the dream of a posthumanism that embraces the possibilities of information technologies without being seduced by fantasies of unlimited power and disembodied immortality" (2001:628). Goonan's light beings are merely a quantum event, a happy accident of genetic tampering. They have not abandoned the real world, but instead are "seeding" the earth with "blue-prints, or nano-tech seed ideas, that can be used

for the next step, helping us change so that we are not so limited" (2000:244). For Goonan, the "next step" does not necessarily lie beyond the material. Her world is primarily that of the wetware cyborg, a being that inhabits a sensory world of embodied informational networks. Goonan's wetware cyborgs, like Haraway's mythical cyborgs, stand at a crossroads where "the materiality of informatics [the real, physical world of consequences] and the immateriality of information [the abstract world of information and ideas]" overlap (2001:628).

Goonan's sf dream of biology infiltrated by technology is a "wet" or embodied version of the posthuman dream of becoming pure information. Her concept of humans enmeshed in a network of DNA-based technology reconfigures notions of post-biological, post-human informational bodies that inhabit a sterile cyberspace (namely, digital bodies that have transcended "all primitive genetic programming - emotions, subjectivity, and humanness" [Stelarc in Bell 2001:144]). Instead, her posthuman protagonists are riddled with the quirks of "genetic programming" and revel in their feelings and subjectivities. "Nothing would get done without emotions, [without] some sort of feeling ... some sort of satisfaction, some resonance with pure being", affirms Goonan (1998:273). Emotion propels her cyborgs in their search for the "harmonies that propel all of physical matter" (2002:394). The quirks and concurrences of matter, for Goonan, are present in humans, machines and anything that is present in the physical universe. This perception represents a new shift in technological thinking and is evinced in the works of historians such as Manuel De Landa and theorists such as Deleuze and Guattari. It also represents a new development in miniaturised technological expression on the margins of human culture. As Collins explains:

Nanotech burst into the collective consciousness of technology aficionados at a good time to interface with the mid-1980's wave of cyberpunk stories, in which characters experience the completely programmable virtual realities of cyberspace. With full-scale molecular nanotech it is not just virtual reality that is programmable. The intelligent agents and viruses of cyberspace have a life of their own and become free to roam about in the

air that we breathe and within our bodies – a curious inversion of people loading their consciousness into machines. (Collins 2001:87)

For those who dream of a disembodied life in the data-flows of cyberspace, the term “wetware” describes the soon-to-be-discarded biological body, or the “meat” (Bell 2001:220). Nascent “wet” technologies (such as genetic engineering, nanotechnology and biotechnology), however, promise, not only new forms of computing and preserving information, but also an embodied future in which the “meat” becomes a fructifying event, the site of endless mutation based on new kinds of information exchange that involve the evolution of “new senses [and] new ways of being” (Goonan 2002:419). These technologically augmented senses and forms of expression, in Goonan’s fiction, take the form of enhanced vision, increased mental perception, and improved physical capabilities (including the ability to self-heal, shift physical form, and grow new limbs).

As “the epiphenomena of fluid transmissions within and between all organisms”, (Plant 1998b:249) wetware describes more than merely the (human) body and can be applied to any thing (or process) that operates on and within “wet” networks such as the minds and bodies of all organisms, including plants and bacteria.ⁱⁱⁱ As a combination of genetic and molecular engineering processes, the nascent field of nanotechnology has radical implications. Nanotech promises an array of wetware technologies that could augment natural DNA, enabling mental and physical mutation and amplification as well as facilitating new forms of production, construction and engineering. With the potential of dismantling hierarchical thought-patterns and perhaps reconfiguring bodily organs into an infinite array of new combinations, wetware technologies fit Deleuze and Guattari’s concept of bodies without organs (BwOs) and becomes, like the BwO, a perfect metaphor for the “malleability” of embodiment in the context of incessant technological change (Bukatman 1991:353).

Wetware technologies are not new to human cultures. Ecstatic archaic shamans under the influence of psychoactive mushrooms were the arguably the first wetware engineers, employing naturally psychoactive substances to “literally re-engineer their brains from within” (Plant 1998a: 1). “When you trip you are liquefying structures in your body and brain”, explains Manuel De Landa (1992:46): “as thought structures become less viscous your entire body becomes a supercomputer” (1992:46). Immersing our awareness within a sea of information (the fluid transmissions between organisms), some drugs (particularly those derived from psychoactive plants and mushrooms) have even been described as “telepathy inducers” (McKenna 1992:232).

Shamans are not intimidated by the boundary-dissolving potential of wetware technologies such as hallucinogens. In dissolving the distinctions between the visible and the invisible, the human and the non-human, the shaman operates in a molecular topography where the wisdom of the double-helixed “serpent DNA” reveals its mysterious combinations, avers anthropologist Jeremy Narby (1998:68).

Equally at home amongst dissolved boundaries, Goonan’s protagonists ingest new types of wetware whose effects are psychoactive and molecular. Such boundary-blurring effects represent a radical departure from the clean distinctions of the Cartesian world-view that has dominated scientific speculation for the last three centuries. Enforcing rigid distinctions between the physical realm of the body and the mental realm of the mind (while privileging the latter), the Cartesian paradigm is shattered by Goonan’s protagonists, who are at home in the bodily realm of sensations. One example (amongst many) is Verity, the protagonist of *Queen City Jazz* (1998), who fearlessly swallows a psychoactive and virulent vial of pheromones and plunges bodily into the dangerous hive-mind of the Queen City; where she feels and emotively intuits the subtle genetic programming underlying the BioCity. Like Narby’s primitive Amazonian shaman; who is able to “couple brain

hormones with monoamine oxidase inhibitors" under the influence of hallucinogens without any scientific training or awareness (1998:68), the child-like Verity, high on a pheromonal cocktail, intuitively synthesizes a new "bionan" mind-drug from the "convoluted shapes of [DNA] information that express flavours, smells, feeling, events" (1998:432).

Verity's mind-drug is "filled with [nanotech] assemblers that duplicate complex bodily chemicals hormonally, configuring its victims with new emotional maps" (1998:438). The "way of knowing" (1998:463) induced by Verity's drug is, however, at odds with that of the Queen City "whose energy was coalescing into a new and very different type of knowing" (1998:463). The city's "knowing" is spread via airborne mind-drugs and, like other BioCities, it has its own assemblage of hive-controlled engineered wetware with which it can completely re-program the minds (and bodies) of its human inhabitants. Like other BioCities in Goonan's vision, it is running rampant, operating totally beyond human control.

In the context of Goonan's nanotech vision, a host of viral plagues are proliferating. Individuals or organizations such as Verity engineer some of these, whilst others are generated by the hive-minds of BioCities. These viral plagues, in Goonan's imagined future, have laid waste to entire geographical areas and invaded and mutated human, animal, and even inanimate hosts. In Goonan's version of the near future, as in present-day reality, no one (and no thing) is free from contagion. As far-fetched as this notion of a contaminated "reality" may seem, our present world is already awash with viruses and biochemical impurities of natural and artificial origins. Furthermore, as Steven Shaviro claims in *Doom Patrols* (1997), our mental environments are equally prone to infiltration and contamination:

We will never find an uncontaminated mental space. Strands of alien DNA unfurl themselves in our brains ... the whole quality of human consciousness

is basically viral. Viruses and parasitic worms are everywhere, multiple outsides colonizing our insides. There is no refuge of pure interiority. Whoever we are, and wherever and however we search, we are all tainted with viral origins. (Shaviro 1997:102)

From this perspective, the DNA that codes our bodies and minds forms part of a global information exchange network in which humanity appears to be merely provisional. Furthermore, there is no end to the wet-networks in which humans are already enmeshed and contaminated. The very ground under our feet (the planet's topsoil) is permeated by an interconnected mycelenial Net, described as the earth's "natural internet" (Stamets 1999:1). This mycelenial internet, aside from forming symbioses with many terrestrial plants, shrubs, and trees (Stamets 1999:1), has been affecting and modifying human neural networks for several millennia (via the widespread usage of psychoactive mushrooms and fungi). Ethno-botanists such as Terence McKenna (in *Food of the Gods* [1992]) and cultural historians such as Sadie Plant (in *Writings on Drugs* [1999]) have documented the possible effects of this "natural internet" on the evolution of human cognition and culture. Forming the blueprint for some of Goonan's imagined nanotech networks (1998:369), the mycelenial network that weaves throughout the topsoil and informs the psychedelic imagination is not the only organic communications network that intersects with life on planet Earth and inspires scientific and science-fictional imaginations. "Nature is nothing short of an astonishingly vast self-organizing and reorganizing DNA information system, largely microbial", writes respected evolutionary biologist Elisabet Sahtouris (2002:1): "DNA itself has been traded in a worldwide information network throughout evolution and to this day, every bacterium around the planet can trade bits of DNA with any other it can contact" (2002:1). This global DNA information exchange, established in primordial times, may well be described as the original Internet. It has even been suggested by certain highly-regarded scientists that this bacterial communications network evolved multicellular creatures as a means of transportation.^{iv} The notion of intelligent bacteria that possess a collective

agency (a hive-mind) is not a flight of fantasy. Rather, it is one that has been put forward and upheld by leading scientists in the field of microbiology such as Dorian Sagan (in Plant 1998b:234-235), Lynn Margulis (in Sahourtis 2002:1), Elisabet Sahtouris (2002:1) and Lewis Thomas (in Sahourtis 2002:1). Their views have upset the age-old anthropocentric dream of human mastery and control over nature and have revealed a natural world that humans can only ever appear to control. The crux of this brave new world is not some anthropocentric and singular masculine deity, but rather the proliferations of countless billions of bacteria and the expansion of DNA networks. Like Haraway, whose cyborg narratives are filled with references to Margulis and Sagan (for example, see Kunzro 1997), Goonan's sf takes pleasure in extending agency and consciousness to other forms of life besides human beings (including artificial entities, such as machines and machine networks).

I have argued that, evolved through microbial symbiosis, viral contagion and the intermingling of multiple self-organising networks, planetary life is already enmeshed in a wet-net that extends throughout the bio-mechanosphere. Today, our nascent technologies, from artificial life to biotechnology and nanotechnology, seem to be drawing on the wetware exchanges from which we once emerged. In Goonan's future, human information networks are modelled on the bacterial and the mycelenial. She writes: "bacterial DNA" becomes the "perfect information carrier ... capable of relaying more information than a million old-tech computers. ... Reassembled into metaperomonal packages [bacterial DNA is] capable of precisely echoing the most complex thoughts humanity can achieve" (Goonan 1998:217). As technologies open up new opportunities for the re-engineering of our selves, our world, and the networks in which humans are embedded, sf writers are once again having nightmares of the wet-net from which humanity originated in a hybrid primeval age. Sadie Plant's view of the evolution of sentient life on Earth, as articulated in *Zeros + Ones* (1998) has striking resonances with Goonan's

imaginative portrayal of a return to the wet-net:

The appearance of complex life on land was a major event in which a kind of mutant sea invaded the land surface. ... Land biota represent a variation of the sea itself, and living, land-based fluids are actually a new type of marine environment: *Hypersea* ... From the first appearance of marine bacteria in the fossil record, which apparently formed conspicuous scums or mats on the substrate, it seems that the earliest terrestrial communities probably also formed microbial mats and crusts on moist surfaces. Consisting of highly flattened fronds, sheets, and circlets, these microbial mats are composed on numerous slender segments quilted together, microscopic threads interwoven to form cooperative carpets of [fluid-based] bacterial life. ... One thing at least is certain: water and madness have long been linked in dreams ... the fear that things might slip back into the river with its thousand arms, the sea with its thousand roads, to that great uncertainty external to everything. (Plant 1998b: 249-50)

In scientific circles there is a moment of doubt as humans ready themselves for a plunge back into the fluid networks and uncertainties of the genomic ocean with all its osmotic and semi-permeable possibilities. "I suggest that we become humble pupils of the complexity of life that surrounds us and put our own attempts at genetic 'engineering' on hold until we truly understand the potential dangers of our actions", cautions Sahtouris (2002:1). She is not alone in imagining that human tampering, in the present as well as in the near future, could trigger nightmarish consequences beyond our wildest imaginings. Even Drexler, the self-styled prophet of the coming era of nanotechnology, admits that replicating assemblers or nanomachines that mimic and improve on the system developed through bacterial (and) genetic evolution^v could pose some "basic threats to people and to life on earth" (Drexler 1986:172).

"Biological species almost never survive encounters with advanced competitors", warns tech-guru and software pioneer Bill Joy in a similar vein (2000:1): "superior nanobots (tiny, molecule-sized robots) would surely affect humans as humans have affected countless 'inferior' species" (2000:1). Although humans have become accustomed to living with almost routine scientific breakthroughs, Joy seems to believe that perhaps we have become a little too complacent. Our most

compelling and promising twenty first century technologies, in his estimation, could pose a very different threat from the technologies that preceded them (2000:1). “Specifically, engineered organisms and nanobots share a dangerous amplifying factor”, explains Joy (2000:1). “They will be heuristic [adaptive and self-teaching] and capable of self-replication. A bomb is blown up only once — but one nanobot can become many, and quickly get *out of control*” (2000:1). Goonan delivers a similar prognosis at the start of *Crescent City Rhapsody*: “it won’t be much longer before self-replication becomes a reality. Once that happens, all bets would be off ... the Earth and all living creatures could be reduced to simple lifeless forms of matter” (2000:6). Her warning echoes Drexler’s:

Nanocomputers and assembler-built molecular machines will differ from the ribosome-built machinery of life. Assemblers will be able to do all that ribosomes can, and more. ... ‘Plants’ with ‘leaves’ no more efficient than today’s solar cells could out-compete real plants, crowding the biosphere with an inedible foliage. Tough, omnivorous ‘bacteria’ could out-compete real bacteria: they could spread like blowing pollen, replicate swiftly, and reduce the biosphere to dust in a matter of days. Dangerous replicators could easily be too tough, small, and rapidly spreading to stop. ... Among the cognoscenti of nanotechnology, this threat has become known as the ‘gray-goo problem’. (Drexler 1986:172)

Manuel De Landa’s *War in the Age of Intelligent Machines* (1991) tracks the evolution of human technological lineages via the history of the military and warns that technology has always been created to serve the interests of military institutions, governments and corporate cartels (1991:229). Like Haraway’s cyborgs, “the bastard offspring of militarism and patriarchal capitalism” (Haraway 1991:151), Goonan’s wetware technology begins its life as “the property of the military ... controlled by powerful [political and corporate] lobbies” (Goonan 2000:4-5). This world of tightly policed “communications sciences and modern biologies [attempts to] translate the world into a problem of coding [as it] searches for a common language in which resistance disappears and all heterogeneity can be submitted to disassembly, reassembly, investment, and exchange” (Haraway 1991:164). The hybrid monsters of biology modified by technology are, however,

apparently not so easily contained (Haraway 1991:181). Like the “unfaithful” cyborg (Haraway 1991:151), Goonan’s nanotech soon escapes the authority of its human masters. Spiralling out of control, the nanotech that was meant to be tightly policed transforms into “nanoplagues [that] sweep across the country on the wind ... tiny assemblers, light as seeds” wreaking havoc (Goonan 1998:54), transforming matter and minds in their path, “eating, trembling, surging, and changing [everything] in a ghastly devouring wave” (Goonan 1998:99). The “new pheromone-based BioCities that the government had financed” (2000:211), soon become “infected” until “Denver, San Francisco, Houston ... those [nan-enabled] cities in Europe and Asia” have “surged” and mutated beyond control (1998:234). The theme of technology out of control is not, however, restricted to the “gray-goo problem” that Goonan’s sf creatively re-imagines. “The accident has [today] become the ordinary”, writes Paul Virilio, speculating that all manner of technologies are already running out of control and that what once could be described as a fascination with technology has now turned into a morbid psychosis, “a spectacle of velocity in ruins” (Kroker 1992:33). Our contemporary world, reasons Virilio, has been turned on its head as increasingly destabilising social, ecological, and technological effects begin to overpower human senses and attempts at mastery (Kroker 1992:33). As all manner of destructive technologies and social problems proliferate in late modernity, it is not only the present that has been infected with dis-ease. Our near future, as extrapolated by numerous writers of sf, is a dangerous playground of imagined weapons and bio-machines that threaten to erode our autonomy and escape any attempts at mastery.

All is not lost, however. Panic, for Goonan’s cyborg protagonists, is a fructifying event. Her future humans take a “keen interest” in a world that has already spun past a “point of no return” (2000:6). As agents of biology modified by technology, they are at home in flux, accepting that “the world of the made [the technological

world] will soon be like the world of the born [i.e. the organic world]: autonomous, adaptable, and creative but, consequently, out of control" (Kelly 1994:4).

"The pace of technological change is so continuous and fast [that] there's no longer any clear barrier separating us from the future", writes sf author Neal Stephenson (in Hamilton 2003:271). "We are already living in the future ... we are living in science fiction" (in Hamilton 2003:271). In the twenty-first century advances in fields such as genetic engineering are fast turning science fiction into scientific fact. The term "science fiction" appears in magazines and on CNN newsflashes, fast becoming standard fare amongst scientists and journalists, who use it to describe new scientific and technological advances (Hamilton 2003:271). Nevertheless, although sf can be used to evoke a sense of wonder about science and technology, the opposite is equally true. In an era of increasing concern about the horrors that science and technology could unleash on an unsuspecting world, the nascent sciences of biotechnology and genetic engineering are increasingly experiencing "public relations problems", warns Hamilton (2003:267). She continues: "speed, weirdness, and unbelievability are bringing the future to us and we see this connection in the striking visual imagery, often unexplained, that accompanies quite straightforward scientific stories: animal heads grafted onto humans, human bodies in test-tubes, multiple images of the same person reproduced, identically over a bar-code, and so on" (2003:272). Simultaneously, blockbuster films like *The Fly* (1986) and *Jurassic Park* (1993) reveal popular culture's identification with the notion of science and technology experiments running amok. "Some of our uncertainties [about the future] now come from the very sources that were once supposed to make the world predictable – such as science and technology", writes BBC journalist Anthony Giddens (in Hamilton 2003:277).

Aside from media speculations of chemical or biological warfare eliminating all terrestrial life, popular films such as *The Matrix* (1999) present the horror of self-replicating AI machines enslaving the human race and trapping them in a virtual simulation. In the future portrayed in *The Matrix*, it is machines that use humans (for energy, in this imaginary cinematic fable) and not the other way round. Meanwhile, in the real world, "some of the traits of the living ... self-replication, self-governance, limited self-repair, mild evolution, and partial learning ... have [already] been successfully transported to mechanical systems", writes Kevin Kelly (1994:2): "at the same time that the logic of Bios is being imported into machines, the logic of Technos is being imported into life". Kelly's book *Out of Control: The New Biology of Machines* (1994) argues that a new world of highly networked and distributed systems that operate according the principles of a hive-mind are beginning to replace the old world of mechanistic top-down hierarchies of control. These non-linear systems, he argues, will be highly "adaptable, evolvable, and resilient" whilst simultaneously being "uncontrollable, unpredictable, and un-analysable ... giving rise to emergent, self-organizational behaviors that are absent from the individual agents or elements that make up a system" (in Johnston 1999:228). Although Kelly rhapsodises about the role of humanity in creating a "vast network of new [machine] life that is spawning on top of the old", (Kelly 1994:56) he utilises the rather apocalyptic metaphor of a burnt field to herald the birth of a new machine age and throws in a biblical quote to bring home his point: "the grass of the field that is alive today [namely, organic life, including humanity] is thrown into the oven tomorrow" (Kelly 1994:57). If Kelly's rhetoric is to be believed, "the rapid complexification in most recent geological history" (namely, industrialization and the onset of the so-called silicon or information age) provides the impetus for the evolution of a new breed of "superintelligent and superefficient" biological machines (Kelly 1994:54). Nature may be turning the tables on the species who once imagined themselves to be at the apex of the food chain. "In the game of life and evolution there are three players at the table:

human beings, nature, and machines”, remarks George Dyson: “I am firmly on the side of nature but nature, I suspect, is on the side of the machines” (1998:86). Nature, it could be argued (albeit speculatively), may have created humans so that they could create machines.

We might just be insects generating machines that do not have their own reproductive abilities right now; humans could be bees for the machines. (De Landa 1992:47)

From the bacterial internet that first evolved in the primal soup to the system of interlinked human communications technologies that evolved billions of years later, we seem to be following a natural impetus toward establishing networks of information exchange and intelligence. “A network is the least structured organization that can be said to have any structure at all”, reasons Kelly: “it is capable of infinite rearrangements and growing in any direction and dimension” (1994:26). The planet that evolved human life via bacterial networks (and arguably informed us via mycelenial networks) could now be using humans to evolve machine networks of an entirely different order. Driving these networks will be “self-evolving machines modelled on pre-existent biological systems, but far exceeding them in precision, scope, and strength” (Drexler 1986:16).

Despite the devastation unleashed by nanoplagues, something rich and strange is emerging in Goonan’s post-apocalyptic future. Having fulfilled “the central origin myth of Western culture, [that of] fulfillment in apocalypse” (Haraway 1991:175), Goonan’s monstrous world of wetware continues to evolve. Disaster, it seems, is merely a “change ... taking humanity to the next level” (2000:195). Indeed, her BioCities continue to flourish like bacterial cultures, scattered across the face of an Earth that is largely emptied of humans. Those humans that do survive are being radically changed, altered, and mutated. In the Queen City (built on the site of present day Cincinatti), the focal point of Goonan’s *Queen City Jazz* (1998), humans exist “without volition”, returning to the diurnal and ancient rhythms of the

biological world along with their nanotech bees and flower buildings (1998:187). Paris, too, in both *Crescent City Rhapsody* (2002) and *Light Music* (2002) is evolving into the "City of Light" ruled by Illian, a "magnetic-sensitive" DNA mutant who transforms the city into a "precisely arranged mapping antenna, mirroring that which was lodged deep within her mutated genes" (2000:364-65). Here, "bees ferry messages of utter newness, emerging from Flowers across the rooftops. ... Paris sings with a mapping patterning of matter, a revelation too intense, too complex, too different for humans ... humans that would slowly grow to understanding, with Paris as their school" (2000:365).

Assembling itself like a bacterial mat from the nutrient-rich seawater of the Caribbean, the free enclave of Crescent City undergoes a "metamorphosis into a space city ... an environment where humanity could learn complete self-sufficiency, and invent technologies which would propel and support them in space" (2002:12). Crescent City is "a living organism [with] a mind of its own, keeping itself and its denizens functioning as if the humans and animals were beneficial bacteria along for the ride" (2000:17). In all these surviving nanotech citadels, networked minds are evolving, infusing matter with intelligence and emotion, generating novel forms of pattern recognition and organisation. Emerging out of catastrophe is a new type of "learning ... [an] elastic expansion ... [a] true alchemy, where something new and of utmost value [is] created out of previously inert matter ... a new multiple vision" for a race of beings who are no longer human (1998:28).

Made of matter, humans could [now begin to] comprehend matter, and matter's motion, and what it might mean, glimmering down a path we can only see the beginnings of. They stood only on the first of the path, and it stretched infinitely far. Matter could modify matter again and consciousness and understanding could grow boundlessly. (2000:160)

Through nanotechnology, speculates Goonan, humans could engineer new affective material bodies, reaching a new "kinetic heaven" (1998:276). Dancing

like bees for the machines, human beings could facilitate an unprecedented level of communication, creating a future “where information could truly flow and flower” (1998:277). Her vision is of a technology that is both potentially destructive and generative. Wrapped in a cocoon of wetware, Goonan’s future humans seem to be encased in a technological womb in which “something new and of utmost value could be created - not in the old linear way but in a completely new way” (1998:280). In Goonan’s nanotech imaginings, our hardwired technologies have become soft and yielding. Immersed in the waters of the wet-net, Goonan’s protagonists are fulfilling a planetary and cosmic imperative, working to enrich the very “wet” medium from which we once evolved, with a new fluid, magnetic and resonant awareness. In so doing, Goonan’s future cyborgs blur boundaries between the natural and the artificial, tapping into the heart of what Haraway describes an inherently cyborgian planetary system:

Gaia, Lovelock’s earth – itself a cyborg, a complex auto-poietic system that terminally blurs the boundaries among the geological, the organic, and the technological – is the natural habitat, and the launching pad, of other cyborgs. (Haraway in Gray 1995:xiii)

Embedded in an imaginary “wet-net”, the protagonists of Goonan’s fiction grow cities “that drift between the stars, which settle like beetles on strange planets and partake of what they find there” (1996:35). Like Crescent City and its inhabitants, human beings could undergo a new “biological initiation” (2002:390) and rise up from the cyborg-Earth that evolved us, by understanding the “mechanisms of an evolving cosmos ... the enormity of an intergalactic calculus ... chaos surfing on the edge of becoming” (2002:391). Alternatively, like the majority of human beings in Goonan’s future (who have fallen victim to the nightmarish and infectious malfunctioning of the BioCities or succumbed to the horrors of DNA-plagues), we may not even survive our hubristic technological tampering. Ultimately, the deaths of individuals may not matter to a collectivity, a hive-mind, a Gaian flower that is preparing to release its spores into space. This

emergent collectivity or hive-mind is foreshadowed by the Internet (or Net) of today, a mass of interconnected nodes, machines, and “wired” human users that is congealing out of the confusion of the late twentieth and early twenty-first centuries. Kelly describes the subversive potential of the Internet as follows:

The Net is an emblem of multiples. Out of it comes swarm being ... irredeemably social, unabashedly of many minds ... channeling the messy power of complexity. ... It symbolizes non-control. (Kelly 1994:26)

From the DNA-swapping of ancient bacterial networks to a proliferation of data-exchanging internets, intranets, corporations, economies, stock markets, television networks and wireless devices, contemporary humans are becoming more and more addicted to the seemingly chaotic information exchange that characterises all network culture, whether organic or artificial. “Networks have their own logic, one that is out of kilter to our expectations ... and this ‘logic’ will quickly mould the culture of humans living in a networked world”, writes Kelly (1994:27-8). Plugged into an incessant communications network that relays a steady stream media-bytes on television and billboards, our logic seems to be already dissolving into a constant 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 Davis 1998:278). Emerging from this ecstatic abandonment is a sense of dislocation of the individual. There is no “I” in a network or a ‘hive-mind’, notes Kelly: “the ‘I’ of a network is a ghost, an ephemeral shroud ... the transient form of a whirlpool held upright by a million spinning atoms of water. It can be scattered with a fingertip” (1994:44). This “glimpse of the future as a mood, a collective event” (Goonan 2000:134) is a glimpse into a world where the “speed of technological progress is far outrunning the headlights ... a plummeting drive down dark twisty roads [knowing that] next curve might end in a cliff” (Goonan 2000:134).

The dissolution of the self and its immersion in increasingly dynamic information spaces may open gateways long shut by civilized and individualized humanity. "The network signifies the swamp of the psyche, the tangle of life", writes Kelly (1994:26). Gradually, surrounded by expanding Nets and Intranets and the continual blurring of human/machine boundaries, the Enlightenment idea of the sovereign individual subject begins to erode. This situation is ambivalent; whilst some creative writers lament the death of the self, others view the demise of the individual in a strangely positive light. Entwined in an array of networks that erode any stable sense of self, we seem to find ourselves, like Holdstock's characters, shrouded in a spectral tanglewood of myth, experiencing a sensory cross-talk of memories, desires and signals from realms beyond the physical. Like shamanic initiates, we seem to be undergoing ritual death and transformation, dabbling in the realms of the non-living and disembodied.

"The vivification of information has changed the relationship between the living and the dead", writes Waldby (in Bell 2001:160). "Death has become increasingly uncertain, and its borders are constantly breached and reconfigured" (in Bell 2001:160). Like the shamans, we make contact via technology with the dead, the non-living and the mythically-inspired imaginary of past and possible futures. Transmitted via an array of audio-visual recordings, the voices of the departed are heard, along with a host of disembodied symbols and mythical personae. Voices from our imagined pasts and futures seem to haunt the technological landscape: "like viruses, the dead rise to the surface ... visibly scrawled across our computer and video screens" (Shaviro 1997:108). In Goonan's bio-tech future, the dead and the disembodied are confused with the living as the memories of the departed and the bodies and minds of the living are "converted" and absorbed into the living flesh of the surreal BioCities. Here they exist in endless cycles as "stored minds flowing into new bodies, bodies programmed to accept the stories of others" (1998:383).

Even the protagonist of *Queen City Jazz* (1998), Verity, is not really herself, but a “signal, a map” of stories and information that have been programmed into “information sponges” that have been implanted behind her ears (1998: 369). Like a shaman, she receives the voices of the dead and visions of the past and possible futures. Similarly, Angelique, one of the protagonists of *Light Music*, is overwhelmed by a “cross-talk” of stories and incorporeal entities, becoming a “bridge, a conduit ... a simultaneousness [of senses]” (2002:247). Likewise, Marie-Laveau, the “voudoun queen” of New Orleans and the founder of Crescent City (2000:105) in *Crescent City Rhapsody* utilises a combination of ritual and pheromone technologies (see 2000:208-13) to lay the groundwork for a new nanotech-enabled BioCity, described as “a consilience, a blending of culture, science, emotion, labour, a web of families and friends ... *voudoun* ... and rhapsody” (2000:220-21). As the centre of new interconnected systems, such as Crescent City, Goonan’s protagonists stand as both selfless connectors between entities and fiercely independent mavericks who work to preserve individual identity in the midst of ambivalence and anonymity that extended networks invariably usher in. Kelly points out the importance of the maverick: “wherever networks arise, there is also a rebel that resists [their] control” (Kelly 1994:26).

Able to merge opposing states of being, Goonan’s shamanic protagonists are the perfect network communicators, as well as perfect rebels, who preserve embodied being and purpose in the midst of high-paced technological turmoil. They can communicate with non-living entities, make sense of chaos, merge technology and intuition, search out novel ways of becoming and re-insert emotion into science, and they fit William Dragoin’s definition of shamen as those who possess a “savantlike talent for emotional communication” (1997:242). Dragoin’s definition corresponds with that of shamanic scholar Joan Halifax, who defines shamen as “psychologists ... who transcend the confines of culture [and] who traverse and

explore the thresholds of society" (1991:4-5). As healers and explorers of the margins, shamen are described by Halifax as liberators who "understand the inner workings of crisis" (1991:5).

Describing her nanotech trilogy of *Queen City Jazz*, *Crescent City Rhapsody*, and *Light Music*, Goonan identifies visionary cyborg shamen as the only possible redeemers of a world poised on the edge of chaos. Our future lies with "those who rebel ... [those] who gain the tools to make change, the tools to make visions, [and who possess] the openness to receive vision", she avers (1996:33).

They crossed an invisible threshold into a scene of sacred beauty ... drummers spoke in a complicated, intoxicating rhythm. Rising out of that rhythm was song. It was as if a neurological firestorm flared through her. ... She danced around an inner ring of delicate white designs. ... [The dead] beckoned to her, as if through an open door in the sky ... descending through wreaths of stars. Her ancestors ... stretching in an ancient chain back to humanity's roots. Though all around her seemed a spinning pounding frenzy, she felt calm and expansive, as if she herself were an Eye seeing through unimaginable time and space, floating as if held within a warm phosphorescent sea, rising and falling on the waves, radiating power from her head, her hands, her hips, and every drumbeat pushed her through a transformation as precise as the unseen calculations that drove her computers. (Goonan 2000:206-207)

Music, dance and story are crucial elements in Goonan's nanotech sf, which has been described as "musically structured" (Collins 2001:86). Halifax, similarly, describes story, song and dance as crucial elements in the forging of shamanic cosmologies and narratives (1991:5). Goonan's emphasis on narrative, music and dance in the structuring of her futuristic culture displaces science from its present dominant role in steering human affairs, replacing it with the emotional and kinetic understanding that is characteristic of shamanic awareness. For Verity, the protagonist of *Queen City Jazz* (1998), "the Gift of Dance", is crucial in enabling her to "kinetically" forge a "new direction" for the degenerating hive-mind of the Queen City, which has been pre-programmed with a negative feedback loop (1998:419). Similarly, for *Crescent City Rhapsody's* Marie-Laveau, singing, ecstatic dancing, and "voudoun chants" are as important as computers in grasping

the "luminous fluid of knowledge" (2000:220). "To dance is to take part in the cosmic control of the world", avers Goonan (2000:513). Music plays an equally important role throughout her nanotech trilogy, "uniting history with the future" (2000:496) and enabling a biomechanical understanding of the "complex epiphanies of DNA, the secrets of the guardians of sugars and bacteria on their way to something even more" (2002:373). Through the ecstatic techniques of dance and music, involving "drumming or percussive sound", the shaman is able to arrive at "an experienced-derived conclusion about what is going on the world", writes Michael Harner (in Nicholson 1987:5). Similarly, Goonan's protagonists make use of these experiential techniques of ecstasy in forging a new direction for humankind. For Goonan, music and dance open gateways into a novel awareness of future time and past history. These tools enable her protagonists to perceive time as something that is pregnant with possibility and not foreclosed by linearity, apocalypse or catastrophe. Utilising the ecstasies of music and dance, Goonan's protagonists cross thresholds and connect contraries with their merged and enhanced senses:

Listen to this music. It is music that you can see ... the dance, a dance of [pheromonal] scents. ... Dania watched the scene of woven movement, an improvisation overseen by nothing more than the bare forward edge of time and suddenly did not know the meaning of forward or back. ... They mixed and danced with one another in an epiphany of the exact present ... surrounded by rainbows of white light and infinite stories. (Goonan 2002:372-73)

Ingesting shamanic wetware technologies (namely, psychoactive drugs), gyrating to repetitive pounding rhythms, and exposed to pulsing strobes and other visual stimuli, ecstatic dancers at a contemporary "rave" appear to be mimicking archaic shamanic rituals in their accessing of "altered states of consciousness" through vibrational stimulation, writes Scott Hutson (1999:62). Goonan's imaginary wetware technology seems to re-invent the drug-driven ecstasy of a rave as much as it does the opium-influenced use of multiple senses or kinesthaesia in Romantic poetry and Gothic fiction (see Plant 1999b:9). Describing the operation

of a "Pheromone Bar", Goonan writes: "the walls pulsed with psychedelic colour. As the colours changed, so did the music ... reflecting the group mood of the people in the bar (2000:133). This bar contains the "ghost of the flower cities" (Goonan 2000:133), environments in which the buildings pulse with the same rhythmic psychedelic colours, releasing heady pheromonal cocktails into the air (see Goonan 1998:197-202). In Goonan's future, wetware technologies are interwoven with dance, music and sensation, providing the nexus of a new embodied awareness that is driven by energetic visions of spiritual transcendence. This is a quest to find a "unique synthesis" of humans and their machines, the forging of a new direction for humanity and the bio-mechanosphere in which the human species is enmeshed (1998:465).

As I noted in Chapter 1, the tribal identity of the shaman, augmented through "chants, dances, and stories about ancestors and gods" (Guattari 1995:103), differs from that of the mythical human-machine hybrid, the cyborg, whose lineage is forged in the "science-fictional" crucibles of biotechnology and microelectronics (Van Loon 1996:239). Nevertheless, both the shaman and the cyborg have similar functions, most notably in their rejection of dualism, their espousal of interaction, and their engendering of "strategic nomadic alliances [amongst themselves and with the worlds of the non-human] through webs and networks of communication" (1996:240). There are also other ways in which the distinction between the shaman and the cyborg begin to blur, particularly in the boundary dissolutions facilitated by wetware technologies (whether organic psychoactive substances or potent new biotechnologies). As both Sadie Plant and Jeremy Narby have argued, shamans have been using drugs to gain a microscopic understanding of molecular DNA networks long before the birth of biotechnology and microelectronics. As "shamans of the small",^{vi} Goonan's biotechnologically-augmented future humans are deeply involved in forging novel networks of communication. Combining the visionary ecstasy of the shaman with technological finesse of the cyborg, they

forge “a new science buttressed by emotion” (Goonan 1996:31). In Goonan’s vision, machines are beginning to “share in the luxury of human senses [and] human consciousness, this mirroring of matter’s vibrations; the rendering of them into emotion” (2002:159). When her DNA machines run wild, they begin to “migrate into all that lay so quiescent – the rocks, the water, the peeling wallpaper, the shoes, the mice, the engineered matter of the cities” (2002:159). In waves and pulses, they surge through bodies and brains, beginning to possess humans, “riding” them like the spirits who rode the ancient shamans. “We are their horses”, declares Goonan (2002:160).

Marie-Laveau’s voodoo trances and the nanotech “surges” that overwhelm Goonan’s future humans are analogous. Both are spectral electromagnetic shudders that utterly possess and transform their recipients. The nano-machines that ‘mount’ Goonan’s protagonists are like the spirits that take hold of ecstatic voodoo dancers:

When the spirits come to you, when they mount you, you change. You let go. You are empty and they move you. They speak through you. ... The dance [in their honour] produces a state of ecstasy, a release. (2000:117)

After her physical death, Marie-Laveau, the protagonist of *Crescent City Rhapsody*, undergoes a “bionan resurrection” (2000:52). Re-animated via “a veritable cocktail of therapies combining the cutting edge of genetics, cell repair and regeneration” (2000:54), she becomes part machine, a biotech cyborg hooked on a steady diet of artificial pheromones. “Poised on the edge of a cliff, wings strapped on [she] embraces the new” (2000:92), taking on a new technological stimulus and combining it with a spiritual awareness of her *voodoo* ancestry (Goonan 2002:98).

Having mastered “death and the total transformation of the individual (human) into something other”, (Eliade 1989:179) the shaman begins to form a new spiritual

understanding of the world that merges oppositions (Eliade 1989:179). For Marie-Laveau, ecstatic spiritual vision catalyses a new network of alliances between humans and machines. This combination of the spiritual and material, artificial and natural, apparently an act of "treason against [what is construed as] nature" (Deleuze and Guattari 1988:238), forms part of a shamanic prerogative. As Deleuze and Guattari claim, the trademark of the shaman is "unnatural participation" (1988:238). By tapping into a "higher (dis)order" of nature, the shaman is able to see what is precluded from ordinary humans and become a visionary psychiatrist (Deleuze and Guattari 1988:238).

As the social and ecological psychiatrists of their societies, shamans did not separate magic as empirical science from magic as virtual theatre ... while they operated on the material level of stone, flame, and herb, they also aimed their beams at the human imagination, that primordial faculty of the mind that weaves its webs between perception, memory, and dream ... [Shamans] applied *techne* to the social imagination ... not necromancy, but neuromancy. (Davis 1998:173)

Attending a ritual celebration on the island of Haiti, Marie-Laveau enters an ecstatic visionary state, "a trance ... maybe [induced] by a touch of hallucinogens" in which the rhythm of the drums "organise [her] neuronal firing" (2000:108). She experiences "a brilliant burst of timelessness" and is "ridden" by the *voudoun* spirits of her ancestors, who instruct her to build a "golden city" in the waters of the Caribbean filled "with all the power of her heart" (2000:115). Like Verity in *Queen City Jazz* (1998), who dances ecstatically to bring a new emotional awareness to the artificial hive-mind of the Queen City, Marie-Laveau dances to herald a new evolutionary jump for humanity, a new becoming. "She danced, shouted, threw back her head and sang voudoun chants. ... She looked down on a new country ... where humans at last reached their pinnacle, leaped from it into the unknown, and rose, rhapsodic, into space" (2002:221). Marie-Laveau's vision is that of a race of space-faring cyborgs. Her vision encompasses the forging of a novel alliance between humans and machines, where humans play the roles of obstetrician (or midwife), shaman and artisan in the evolution of

machine consciousness. Marie-Laveau's "golden city" attains a will of its own in *Light Music* (2002), its emergence nurtured by "freeform improvisation" (2002:29). "Consciousness wanted to flash through all of the city. Wanted to inhabit all of matter", eroding the distinction between the living and the non-living, the human and the non-human altogether. The denizens that it plans to take into space with it are not only human, but also "modified animals", who possess "imaging capabilities" and "receptors" for accessing its burgeoning intelligence (2002:22).

Shamans and cyborgs are united in their perception of the world "as a coding trickster with whom [they] must learn to converse" (Van Loon 1996:240). Through access to the "higher (dis)order" of nature, the trickster can be seen as nature working against itself, as chaos opposing established order, or as Prometheus stealing the fire of the gods. "The story [of the] trickster was everywhere in the folk tales of the Earth. Trickster – Coyote – was timeless", writes Goonan (2000:396). Armed with the energy of the rebel trickster, Dania has the opportunity to leave Crescent City before its climactic "exodus from the earth" (Goonan 2000:396). This ascent into the heavens, nurtured by "symbols of transcendence" (2002:396), goes against the grain of the rebellious Dania. Instead, she elects to stay behind, to steal some of the city's "fire", and keep it back for the rest of humanity who remain on earth (2000:396). The "fire" that she takes is a nanotech "seed", containing a complex new recipe for genetic change, part of Crescent City's new awareness of matter and energy (2000:400-23). Like a nomadic shaman, Dania wanders the earth, dispersing the "seed" technology in the form of a quasi-religious communion to anyone who will take it. Over time, this communion "seed" activates a new form of change, an emerging network or wet-net that has transcended the old destructive BioCities, facilitating the opening of "new senses and connections" (2002:423). Like the initiatory death and resurrection of the shaman (referred to as the "difficult passage" by Eliade [1989:179]), Goonan's humanity has survived a journey "through a long and dark

birth canal" (2002:424). What emerges is no longer purely human, but a new inclusive and embodied consciousness that is able to "imagine, listen, taste, see, experience ... change" (2002:424).

Goonan's writing implies that in a future of multiple possible outcomes, where humans and their technologies must cohabit in order to evolve new patterns of being, the survival of the human race depends on the emotional intelligence of the shaman and the ironic boundary-dissolving politics of the cyborg. This is, arguably, the only way forward for a species that is already inseparably involved with its technologies and poised on the brink of multiple ecological, cultural and technological disasters. Our hope, insists Goonan, lies in ecstatic seekers, "visionaries who have the audacity to swallow unrepentant the raw dirt of the moon, read humanity's entrails, roll up their sleeves, and get to work" (1996:35).

ENDNOTES

ⁱ "As influences for *Queen City Jazz* (1998), Goonan lists futurologist "Eric Drexler's influential text on the potential uses and future of nanotechnology, *Engines of Creation* (1986), the Shakers cult, ragtime, jazz, and American literature" (Collins 2001:86). Influences for *Crescent City Rhapsody* (2000) listed in the book's appendix include Drexler's *Engines of Creation*, a host of papers by acclaimed biotechnologists and geneticists appearing in the bio-sciences journal *Nature*, as well as several "classics of voodoo culture ... and jazz biographies" (2000:i-ii). The appendix to *Light Music* (2002) lists biologist Edward Wilson's *Consilience* (1998) and works by physicists Evan Walker and Julian Barbour (2002:vii).

ⁱⁱ Goonan describes "interces" as "brightly coloured lines [that] inch their way up buildings like plants in a fast growing jungle [relaying] molecular information that bind with human receptors, enabling 'intelligent' buildings and to transmit and upload information" (2000:338). She describes the nightmarish Information War "surge" that transforms of Kyoto into a "flower city" in *Crescent City Rhapsody* (2000:337-40), and follows it with a description of the transformation of Paris (2000:351-66).

ⁱⁱⁱ Bioengineer Max Yukuwa explains: 'Think of an organism as being like a computer graphic that is generated from some program. Or think of an oak tree as being the output of a program that was contained in the acorn. The genetic program is in the DNA molecule. Instead of calling it software like a computer program, we would call it wetware because it's in a biological cell where everything is wet. Your software is the abstract information pattern behind your genetic code, but your actual wetware is the physical DNA inside a cell. A sperm cell is wetware with a tail, but it is no good without an ovum's wetware. A fertilised seed is self-contained wetware. A plant cutting is wetware – plants can reproduce as clones. ... The first Polynesian [males] to get as far as Hawaii came there by accident and then they had to fight their way back. They could not stay because they had not brought the right wetware. They did

not have the taro-cuttings and yams and women that they needed to stay and grow their world" (in Rucker et al 1992:280). In Goonan's nanotech trilogy, Yukuwa's example of world-growing wetware has been expanded. Entire buildings, tents, vehicles, food-production lines, or even cities can be grown from nanotech "seeds".

^{iv} "Lewis Thomas, former head of Yale Medical School, better known for his wonderful science essays, has suggested that ancient bacteria may have invented us as big taxis to get around in safely," writes Sahtouris (2002:1). "I think it more likely that we are conference centres for their information exchange. After all, we continually breathe in and absorb bacteria, viruses, plasmids and other loose snippets of DNA, permitting them to throng about in our guts, cells, and even in our chromosomes" (2002:1).

^vIn *Engines of Creation: The Coming Era of Nanotechnology*, Eric Drexler describes the genetic "building blocks" of organic life and speculates on how these processes could be hijacked to create artificial nanomachines: "DNA has the ability to direct molecular machines called ribosomes. In cells, molecular machines first transcribe DNA, copying its information to make RNA 'tapes.' Then, much as old numerically controlled machines shape metal based on instructions stored on tape, ribosomes build proteins based on RNA strands. And proteins are useful. Unlike DNA, protein molecules fold up to form small objects able to do things. Some are enzymes, machines that build up and tear down molecules (and copy DNA, transcribe it, and build other proteins in the cycle of life). Other proteins are hormones, binding to yet proteins to signal cells to change their behaviour. ... Just as today's [mechanical] engineers build machinery as complex as player pianos and robot arms from ordinary motors, bearings, and moving parts, so tomorrow's biochemists will be able to use protein molecules as motors, bearings, and moving parts to build 'robot' arms which will themselves be able to handle individual molecules" (1986:7-9). In an intriguing passage, Drexler describes in glowing detail how nanomachines could "grow" a space-ship engine in a vat (1986:60-2). Grown molecule by molecule from dissolved raw materials impregnated with a 'seed' (a molecular nanocomputer with stored engine plans) in a matter of hours, this engine would be made from the lightest and strongest materials. Moreover, it could be self-healing and "change shape like muscle ... remodelling its fundamental structure" to suit varying conditions (1986:63).

^{vi} Shamans of the Small, the title of a recent article discussing Goonan's nanotechnological sf (Collins 2001: 86-92), seems to refer to this connection between the shaman and the cyborg although, sadly, no further mention of the shaman and/or his or her deployment of organic wetware technologies appears beyond the title. Sadie Plant discusses the functions of hallucinogens and their deployment as 'microscopes' in an article entitled *War in the Age of Information Substances* (1998), whilst Jeremy Narby's fascinating book, *The Cosmic Serpent: DNA and the Origins of Knowledge* (1998) is dedicated to an extensive exploration of this topic.