Simians, Cyborgs, and Women
The Reinvention of Nature
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For my parents, 
Dorothy Maguire Haraway (1917–1960) 
and 
Frank O. Haraway
thesis that one is not born a woman, with all the consequences of that insight, in the light of Marxism and psychoanalysis, for understanding that any finally coherent subject is a fantasy, and that personal and collective identity is precarious and constantly socially reconstituted (Coward, 1983, p. 265), then the title of bell hooks's provocative book, echoing the great nineteenth-century black feminist and abolitionist, Sojourner Truth, Ain't I a Woman (1981), bristles with irony, as the identity of 'woman' is both claimed and deconstructed simultaneously. Struggle over the agents, memories, and terms of these reconstitutions is at the heart of feminist sex/gender politics.

The refusal to become or to remain a 'gendered' man or a woman, then, is an eminently political insistence on emerging from the nightmare of the all-too-real, imaginary narrative of sex and race. Finally and ironically, the political and explanatory power of the 'social' category of gender depends upon historicizing the categories of sex, flesh, body, biology, race, and nature in such a way that the binary, universalizing opposition that spawned the concept of the sex/gender system at a particular time and place in feminist theory implodes into articulated, differentiated, accountable, located, and consequential theories of embodiment, where nature is no longer imagined and enacted as resource to culture or sex to gender. Here is my location for a utopian intersection of heterogeneous, multi-cultural, 'Western' (coloured, white, European, American, Asian, African, Pacific) feminist theories of gender hatched in odd siblingship with contradictory, hostile, fruitful, inherited binary dualisms. Phallogocentrism was the egg ovulated by the master subject, the brooding hen to the permanent chickens of history. But into the nest with that literal-minded egg has been placed the germ of a phoenix that will speak in all the tongues of a world turned upside down.

Chapter Eight

A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century

AN IRONIC DREAM OF A COMMON LANGUAGE FOR WOMEN IN THE INTEGRATED CIRCUIT

This chapter is an effort to build an ironic political myth faithful to feminism, socialism, and materialism. Perhaps more faithful as blasphemy is faithful, than as reverent worship and identification. Blasphemy has always seemed to require taking things very seriously. I know no better stance to adopt from within the secular-religious, evangelical traditions of United States politics, including the politics of socialist feminism. Blasphemy protects one from the moral majority within, while still insisting on the need for community. Blasphemy is not apoxay. Irony is about contradictions that do not resolve into larger wholes, even dialectically, about the tension of holding incompatible things together because both or all are necessary and true. Irony is about humour and serious play. It is also a rhetorical strategy and a political method, one I would like to see more honoured within socialist-feminism. At the centre of my ironic faith, my blasphemy, is the image of the cyborg.

A cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction. Social reality is lived social relations, our most important political construction, a world-changing fiction. The international women's movements have constructed 'women's experience', as well as uncovered or discovered this crucial collective object. This experience is a fiction and fact of the most crucial, political kind. Liberation rests on the construction of the consciousness, the imaginative apprehension, of oppression, and so of possibility. The cyborg is a matter of fiction and lived experience that changes what counts as women's experience in the late twentieth century. This is a struggle over life and death, but the boundary between science fiction and social reality is an optical illusion.

Contemporary science fiction is full of cyborgs - creatures simultaneously animal and machine, who populate worlds ambiguously natural and crafted.
Modern medicine is also full of cyborgs, of couplings between organism and machine, each conceived as coded devices, in an intimacy and with a power that was not generated in the history of sexuality. Cyborg 'sex' restores some of the lovely replicative baroque of ferns and invertebrates (such nice organic prophylactics against heterosexism). Cyborg replication is uncoupled from organic reproduction. Modern production seems like a dream of cyborg colonization work, a dream that makes the nightmare of Taylorism seem idyllic. And modern war is a cyborg orgy, coded by C^4, command-control-communication-intelligence, an $84 billion item in 1984's US defence budget. I am making an argument for the cyborg as a fiction mapping our social and bodily reality and as an imaginative resource suggesting some very fruitful couplings. Michael Foucault's biopolitics is a flaccid premonition of cyborg politics, a very open field.

By the late twentieth century, our time, a mythic time, we are all chimeras, theorized and fabricated hybrids of machine and organism; in short, we are cyborgs. The cyborg is our ontology; it gives us our politics. The cyborg is a condensed image of both imagination and material reality, the two joined centres structuring any possibility of historical transformation. In the traditions of 'Western' science and politics -- the tradition of racist, male-dominant capitalism; the tradition of progress; the tradition of the appropriation of nature as resource for the productions of culture; the tradition of reproduction of the self from the reflections of the other -- the relation between organism and machine has been a border war. The stakes in the border war have been the territories of production, reproduction, and imagination. This chapter is an argument for pleasure in the confusion of boundaries and for responsibility in their construction. It is also an effort to contribute to socialist-feminist culture and theory in a postmodernist, non-naturalist mode and in the utopian tradition of imagining a world without gender, which is perhaps a world without genesis, but maybe also a world without end. The cyborg incarnation is outside salvation history. Nor does it mark time on an oedipal calendar, attempting to heal the terrible cleavages of gender in an oral symbiotic utopia or post-oedipal apocalypse. As Zoe Sofoulis argues in her unpublished manuscript on Jacques Lacan, Melanie Klein, and nuclear culture, Lacklein, the most terrible and perhaps the most promising monsters in cyborg worlds are embodied in non-oedipal narratives with a different logic of repression, which we need to understand for our survival.

The cyborg is a creature in a post-gender world; it has no truck with bisexuality, pre-oedipal symbiosis, unalienated labour, or other seductions to organic wholeness through a final appropriation of all the powers of the parts into a higher unity. In a sense, the cyborg has no origin story in the Western sense -- a 'final' irony since the cyborg is also the awful apocalyptic telos of the

'West's' escalating dominations of abstract individuation, an ultimate self united at last from all dependency, a man in space. An origin story in the 'Western', humanist sense depends on the myth of original unity, fullness, bliss and terror, represented by the phallic mother from whom all humans must separate, the task of individual development and of history, the twin potent myths inscribed most powerfully for us in psychoanalysis and Marxism. Hilary Klein has argued that both Marxism and psychoanalysis, in their concepts of labour and of individuation and gender formation, depend on the plot of original unity out of which difference must be produced and enlisted in a drama of escalating domination of woman/nature. The cyborg skips the step of original unity, of identification with nature in the Western sense. This is its illegitimate promise that might lead to subversion of its teleology as star wars.

The cyborg is resolutely committed to partiality, irony, intimacy, and perversity. It is oppositional, utopian, and completely without innocence. No longer structured by the polarity of public and private, the cyborg defines a technological polis based partly on a revolution of social relations in the oikos, the household. Nature and culture are reworked; the one can no longer be the resource for appropriation or incorporation by the other. The relationships for forming wholes from parts, including those of polarity and hierarchical domination, are at issue in the cyborg world. Unlike the hopes of Frankenstein's monster, the cyborg does not expect its father to save it through a restoration of the garden; that is, through the fabrication of a heterosexual mate, through its completion in a finished whole, a city and cosmos. The cyborg does not dream of community on the model of the organic family, this time without the oedipal project. The cyborg would not recognize the Garden of Eden; it is not made of mud and cannot dream of returning to dust. Perhaps that is why I want to see if cyborgs can subvert the apocalypse of returning to nuclear dust in the manic compulsion to name the Enemy. Cyborgs are not reverent; they do not re-member the cosmos. They are wary of holism, but needy for connection-- they seem to have a natural feel for united front politics, but without the vanguard party. The main trouble with cyborgs, of course, is that they are the illegitimate offspring of militarism and patriarchal capitalism, not to mention state socialism. But illegitimate offspring are often exceedingly unfaithful to their origins. Their fathers, after all, are inessential.

I will return to the science fiction of cyborgs at the end of this chapter, but now I want to signal three crucial boundary breakdowns that make the following political-fictional (political-scientific) analysis possible. By the late twentieth century in United States scientific culture, the boundary between human and animal is thoroughly breached. The last beachheads of uniqueness have been polluted if not turned into amusement parks -- language, tool
use, social behaviour, mental events, nothing really convincingly settles the separation of human and animal. And many people no longer feel the need for such a separation; indeed, many branches of feminist culture affirm the pleasure of connection of human and other living creatures. Movements for animal rights are not irrational denials of human uniqueness; they are a clear-sighted recognition of connection across the discredited breach of nature and culture. Biology and evolutionary theory over the last two centuries have simultaneously produced modern organisms as objects of knowledge and reduced the line between humans and animals to a faint trace re-etched in ideological struggle or professional disputes between life and social science. Within this framework, teaching modern Christian creationism should be fought as a form of child abuse.

Biological-determinist ideology is only one position opened up in scientific culture for arguing the meanings of human animality. There is much room for radical political people to contest the meanings of the breached boundary.2 The cyborg appears in myth precisely where the boundary between human and animal is transgressed. Far from signalling a walling off of people from other living beings, cyborgs signal disturbingly and pleasurably tight coupling. Bestiality has a new status in this cycle of marriage exchange.

The second leaky distinction is between animal-human (organism) and machine. Pre-cybernetic machines could be haunted; there was always the spectre of the ghost in the machine. This dualism structured the dialogue between materialism and idealism that was settled by a dialectical progeny, called spirit or history, according to taste. But basically machines were not self-moving, self-designing, autonomous. They could not achieve man's dream, only mock it. They were not man, an author to himself, but only a caricature of that masculinist reproductive dream. To think they were otherwise was paranoid. Now we are not so sure. Late twentieth-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.

Technological determination is only one ideological space opened up by the reconceptions of machine and organism as coded texts through which we engage in the play of writing and reading the world.3 'Textualization' of everything in poststructuralist, postmodernist theory has been damned by Marxists and socialist feminists for its utopian disregard for the lived relations of domination that ground the 'play' of arbitrary reading.4 It is certainly true that postmodernist strategies, like my cyborg myth, subvert myriad organic wholes (for example, the poem, the primitive culture, the biological organism). In short, the certainty of what counts as nature - a source of insight and promise of innocence - is undermined, probably fatally. The transcendent authorization of interpretation is lost, and with it the ontology grounding 'Western' epistemology. But the alternative is not cynicism or faithlessness, that is, some version of abstract existence, like the accounts of technological determinism destroying 'man' by the 'machine' or 'meaningful political action' by the 'text'. Who cyborgs will be is a radical question; the answers are a matter of survival. Both chimpanzees and artefacts have politics, so why shouldn't we (de Waal, 1982; Winner, 1980)?

The third distinctation is a subset of the second: the boundary between physical and non-physical is very imprecise for us. Pop physics books on the consequences of quantum theory and the indeterminacy principle are a kind of popular scientific equivalent to Harlequin romances* as a marker of radical change in American white heterosexuality: they get it wrong, but they are on the right subject. Modern machines are quintessentially microelectronic devices: they are everywhere and they are invisible. Modern machinery is an irreverent upstart god, mocking the Father's ubiquity and spirituality. The silicon chip is a surface for writing; it is etched in molecular scales disturbed only by atomic noise, the ultimate interference for nuclear scores. Writing, power, and technology are old partners in Western stories of the origin of civilization, but miniaturization has changed our experience of mechanism. Miniaturization has turned out to be about power; small is not so much beautiful as pre-eminently dangerous, as in cruise missiles. Contrast the TV sets of the 1950s or the news cameras of the 1970s with the TV wrist bands or hand-sized video cameras now advertised. Our best machines are made of sunshine; they are all light and clean because they are nothing but signals, electromagnetic waves, a section of a spectrum, and these machines are identically portable, mobile - a matter of immense human pain in Detroit and Singapore. People are nowhere near so fluid, being both material and opaque. Cyborgs are ether, quintessence.

The ubiquity and invisibility of cyborgs is precisely why these sunshine-belt machines are so deadly. They are as hard to see politically as materially. They are about consciousness - or its simulation.5 They are floating signifiers moving in pickup trucks across Europe, blocked more effectively by the witch-weavings of the displaced and so unnatural Greenham women, who read the cyborg webs of power so very well, than by the militant labour of older masculinist politics, whose natural constituency needs defence jobs. Ultimately the 'hardest' science is about the realm of greatest boundary confusion, the realm of pure number, pure spirit, C•I, cryptography, and the preservation of potent secrets. The new machines are so clean and light. Their engineers are sun-worshippers mediating a new scientific revolution

*The US equivalent of Mills & Boon.
associated with the night dream of post-industrial society. The diseases evoked by these clean machines are 'no more' than the minuscule coding changes of an antigen in the immune system, 'no more' than the experience of stress. The nimble fingers of 'Oriental' women, the old fascination of little Anglo-Saxon Victorian girls with doll's houses, women's enforced attention to the small take on quite new dimensions in this world. There might be a cyborg Alice taking account of these new dimensions. Ironically, it might be the unnatural cyborg women making chips in Asia and spiral dancing in Santa Rita jail* whose constructed unities will guide effective oppositional strategies.

So my cyborg myth is about transgressed boundaries, potent fusions, and dangerous possibilities which progressive people might explore as one part of needed political work. One of my premises is that most American socialists and feminists see deepened dualisms of mind and body, animal and machine, idealism and materialism in the social practices, symbolic formulations, and physical artefacts associated with 'high technology' and scientific culture. From One-Dimensional Man (Marcuse, 1964) to The Death of Nature (Merchant, 1980), the analytic resources developed by progressives have insisted on the necessary domination of technics and recalled us to an imagined organic body to integrate our resistance. Another of my premises is that the need for unity of people trying to resist world-wide intensification of domination has never been more acute. But a slightly perverse shift of perspective might better enable us to contest for meanings, as well as for other forms of power and pleasure in technologically mediated societies.

From one perspective, a cyborg world is about the final imposition of a grid of control on the planet, about the final abstraction embodied in a Star Wars apocalypse waged in the name of defence, about the final appropriation of women's bodies in a masculinist ergo of war (Sofia, 1984). From another perspective, a cyborg world might be about lived social and bodily realities in which people are not afraid of their joint kinship with animals and machines, not afraid of permanently partial identities and contradictory standpoints. The political struggle is to see from both perspectives at once because each reveals both dominations and possibilities unimaginable from the other vantage point. Single vision produces worse illusions than double vision or many-headed monsters. Cyborg unities are monstrous and illegitimate; in our present political circumstances, we could hardly hope for more potent myths for resistance and recoupling. I like to imagine LAG, the Livermore Action Group, as a kind of cyborg society, dedicated to realistically converting the laboratories that most fiercely embody and spew out the tools of technological apocalypse, and committed to building a political form that acutely manages to hold together witches, engineers, elders, perverts, Christians, mothers, and Leninists long enough to disarm the state. Fission Impossible is the name of the affinity group in my town.(Affinity: related not by blood but by choice, the appeal of one chemical nuclear group for another, avidity.)

**FRACTURED IDENTITIES**

It has become difficult to name one's feminism by a single adjective or even to insist in every circumstance upon the noun. Consciousness of exclusion through naming is acute. Identities seem contradictory, partial, and strategic. With the hard-won recognition of their social and historical constitution, gender, race, and class cannot provide the basis for belief in 'essential' unity. There is nothing about being 'female' that naturally binds women. There is not even such a state as 'being' female, itself a highly complex category constructed in contested sexual scientific discourses and other social practices. Gender, race, or class consciousness is an achievement forced on us by the terrible historical experience of the contradictory social realities of patriarchy, colonialism, and capitalism. And who counts as 'us' in my own rhetoric? Which identities are available to ground such a potent political myth called 'us', and what could motivate enlistment in this collectivity? Painful fragmentation among feminists (not to mention among women) along every possible fault line has made the concept of _woman_ elusive, an excuse for the matrix of women's dominations of each other. For me — and for many who share a similar historical location in white, professional middle-class, female, radical, North American, mid-adult bodies — the sources of a crisis in political identity are legion. The recent history for much of the US left and US feminism has been a response to this kind of crisis by endless splitting and searches for a new essential unity. But there has also been a growing recognition of another response through coalition — affinity, not identity.

Chela Sandoval (n.d., 1984), from a consideration of specific historical moments in the formation of the new political voice called women of colour, has theorized a hopeful model of political identity called 'oppositional consciousness', born of the skills for reading webs of power by those refused stable membership in the social categories of race, sex, or class. 'Women of color', a name contested at its origins by those whom it would incorporate, as well as a historical consciousness marking systematic breakdown of all the signs of Man in 'Western' traditions, constructs a kind of postmodernist identity out of otherness, difference, and specificity. This postmodernist identity is fully political, whatever might be said about other possible postmodernisms. Sandoval's oppositional consciousness is about contradic-

* A practice at once both spiritual and political that linked guards and arrested anti-nuclear demonstrators in the Alameda County jail in California in the early 1980s.
tory locations and heterochronic calendars, not about relativisms and pluralisms.

Sandoval emphasizes the lack of any essential criterion for identifying who is a woman of colour. She notes that the definition of the group has been by conscious appropriation of negation. For example, a Chicana or US black woman has not been able to speak as a woman or as a black person or as a Chicano. Thus, she was at the bottom of a cascade of negative identities, left out of even the privileged oppressed authorial categories called ‘women and blacks’, who claimed to make the important revolutions. The category ‘woman’ negated all non-white women; ‘black’ negated all non-black people, as well as all black women. But there was also no ‘she’, no singularity, but a sea of differences among US women who have affirmed their historical identity as US women of colour. This identity marks out a self-consciously constructed space that cannot affirm the capacity to act on the basis of natural identification, but only on the basis of conscious coalition, of affinity, of political kinship. Unlike the ‘woman’ of some streams of the white women’s movement in the United States, there is no naturalization of the matrix, or at least this is what Sandoval argues is uniquely available through the power of oppositional consciousness.

Sandoval’s argument has to be seen as one potent formulation for feminists out of the world-wide development of anti-colonialist discourse; that is to say, discourse dissolving the ‘West’ and its highest product – the one who is not animal, barbarian, or woman; man, that is, the author of a cosmos called history. As orientalism is deconstructed politically and semiotically, the identities of the occident destabilize, including those of feminists. Sandoval argues that ‘women of colour’ have a chance to build an effective unity that does not replicate the imperializing, totalizing revolutionary subjects of previous Marxisms and feminisms which had not faced the consequences of the disorderly polyphony emerging from decolonization.

Katie King has emphasized the limits of identification and the political/poetic mechanics of identification built into reading ‘the poem’, that generative core of cultural feminism. King criticizes the persistent tendency among contemporary feminists from different ‘moments’ or ‘conversations’ in feminist practice to taxonomize the women’s movement to make one’s own political tendencies appear to be the telos of the whole. These taxonomies tend to remake feminist history so that it appears to be an ideological struggle among coherent types persisting over time, especially those typical units called radical, liberal, and socialist-feminism. Literally, all other feminisms are either incorporated or marginalized, usually by building an explicit ontology and epistemology. Taxonomies of feminism produce epistemologies to police deviation from official women’s experience. And of course, ‘women’s culture’, like women of colour, is consciously created by mechanisms inducing affinity. The rituals of poetry, music, and certain forms of academic practice have been pre-eminent. The politics of race and culture in the US women’s movements are intimately interwoven. The common achievement of King and Sandoval is learning how to craft a poetic/political unity without relying on a logic of appropriation, incorporation, and taxonomic identification.

The theoretical and practical struggle against unity-through-domination or unity-through-incorporation ironically not only undermines the justifications for patriarchy, colonialism, humanism, positivism, essentialism, scientism, and other unlaunted -isms, but all claims for an organic or natural standpoint. I think that radical and socialist/ Marxist-feminisms have also undermined their/our own epistemological strategies and that this is a crucially valuable step in imagining possible unities. It remains to be seen whether all ‘epistemologies’ as Western political people have known them fail us in the task to build effective affinities.

It is important to note that the effort to construct revolutionary standpoints, epistemologies as achievements of people committed to changing the world, has been part of the process showing the limits of identification. The acid tools of postmodernist theory and the constructive tools of ontological discourse about revolutionary subjects might be seen as ironic allies in dissolving Western selves in the interests of survival. We are excruciatingly conscious of what it means to have a historically constituted body. But with the loss of innocence in our origin, there is no expulsion from the Garden either. Our politics lose the indulgence of guilt with the naive é of innocence. But what would another political myth for socialist-feminism look like? What kind of politics could embrace partial, contradictory, permanently unclosed constructions of personal and collective selves and still be faithful, effective – and, ironically, socialist-feminists?

I do not know of any other time in history when there was greater need for political unity to confront effectively the dominations of ‘race’, ‘gender’, ‘sexuality’, and ‘class’. I also do not know of any other time when the kind of unity we might help build could have been possible. None of ‘us’ have any longer the symbolic or material capability of dictating the shape of reality to any of ‘them’. Or at least ‘we’ cannot claim innocence from practising such dominations. White women, including socialist feminists, discovered (that is, were forced kicking and screaming to notice) the non-innocence of the category ‘woman’. That consciousness changes the geography of all previous categories; it denatures them as heat denatures a fragile protein. Cyborg feminists have to argue that ‘we’ do not want any more natural matrix of unity and that no construction is whole. Innocence, and the corollary insistence on victimhood as the only ground for insight, has done enough damage. But the constructed revolutionary subject must give late-twentieth-
century people pause as well. In the fraying of identities and in the reflexive strategies for constructing them, the possibility opens up for weaving something other than a shrud for the day after the apocalypse that so prophetically ends salvation history.

Both Marxist/socialist-feminisms and radical feminisms have simultaneously naturalized and denatured the category 'woman' and consciousness of the social lives of 'women'. Perhaps a schematic caricature can highlight both kinds of moves. Marxist socialism is rooted in an analysis of wage labour which reveals class structure. The consequence of the wage relationship is systematic alienation, as the worker is dissociated from his (sic) product. Abstraction and illusion rule in knowledge, domination rules in practice. Labour is the pre-eminently privileged category enabling the Marxist to overcome illusion and find that point of view which is necessary for changing the world. Labour is the humanizing activity that makes man; labour is an ontological category permitting the knowledge of a subject, and so the knowledge of subjugation and alienation.

In faithful filiation, socialist-feminism advanced by allyng itself with the basic analytic strategies of Marxism. The main achievement of both Marxist feminists and socialist feminists was to expand the category of labour to accommodate what (some) women did, even when the wage relation was subordinated to a more comprehensive view of labour under capitalist patriarchy. In particular, women's labour in the household and women's activity as mothers generally (that is, reproduction in the socialist-feminist sense), entered theory on the authority of analogy to the Marxian concept of labour. The unity of women here rests on an epistemology based on the ontological structure of 'labour'. Marxist/socialist-feminism does not 'naturalize' unity; it is a possible achievement based on a possible standpoint rooted in social relations. The essentializing move is in the ontological structure of labour or of its analogue, women's activity. The inheritance of Marxian humanism, with its pre-eminently Western self, is the difficulty for me. The contribution from these formulations has been the emphasis on the daily responsibility of real women to build unities, rather than to naturalize them.

Catherine MacKinnon's (1982, 1987) version of radical feminism is itself a caricature of the appropriating, incorporating, totalizing tendencies of Western theories of identity grounding action. It is factually and politically wrong to assimilate all of the diverse 'moments' or 'conversations' in recent women's politics named radical feminism to MacKinnon's version. But the teleological logic of her theory shows how an epistemology and ontology — including their negations — erase or police difference. Only one of the effects of MacKinnon's theory is the rewriting of the history of the polymorphous field called radical feminism. The major effect is the production of a theory of experience, of women's identity, that is a kind of apocalypse for all revolutionary standpoints. That is, the totalization built into this tale of radical feminism achieves its end — the unity of women — by enforcing the experience of and testimony to radical non-being. As for the Marxist/socialist feminist, consciousness is an achievement, not a natural fact. And MacKinnon's theory eliminates some of the difficulties built into humanist revolutionary subjects, but at the cost of radical reductionism.

MacKinnon argues that feminism necessarily adopted a different analytical strategy from Marxism, looking first not at the structure of class, but at the structure of sex/gender and its generative relationship, men's constitution and appropriation of women sexually. Ironically, MacKinnon's 'ontology' constructs a non-subject, a non-being. Another's desire, not the self's labour, is the origin of 'woman'. She therefore develops a theory of consciousness that enforces what can count as 'women's' experience — anything that names sexual violation, indeed, sex itself as far as 'women' can be concerned. Feminist practice is the construction of this form of consciousness; that is, the self-knowledge of a self-who-is-not.

Perversely, sexual appropriation in this feminism still has the epistemological status of labour; that is to say, the point from which an analysis able to contribute to changing the world must flow. But sexual objectification, not alienation, is the consequence of the structure of sex/gender. In the realm of knowledge, the result of sexual objectification is illusion and abstraction. However, a woman is not simply alienated from her product, but in a deep sense does not exist as a subject, or even potential subject, since she owes her existence as a woman to sexual appropriation. To be constituted by another's desire is not the same thing as to be alienated in the violent separation of the labourer from his product.

MacKinnon's radical theory of experience is totalizing in the extreme; it does not so much marginalize as obliterate the authority of any other women's political speech and action. It is a totalization producing what Western patriarchy itself never succeeded in doing — feminists' consciousness of the non-existence of women, except as products of men's desire. I think MacKinnon correctly argues that no Marxian version of identity can firmly ground women's unity. But in solving the problem of the contradictions of any Western revolutionary subject for feminist purposes, she develops an even more authoritarian doctrine of experience. If my complaint about socialist/Marxian standpoints is their unintended erasure of polyvalent, unassimilable, radical difference made visible in anti-colonial discourse and practice, MacKinnon's intentional erasure of all difference through the device of the 'essential' non-existence of women is not reassuring.

In my taxonomy, which like any other taxonomy is a re-inscription of
history, radical feminism can accommodate all the activities of women named by socialist feminists as forms of labour only if the activity can somehow be sexualized. Reproduction had different tones of meanings for the two tendencies, one rooted in labour, one in sex, both calling the consequences of domination and ignorance of social and personal reality 'false consciousness'.

Bay beyond the difficulties or the contributions in the argument of any one author, neither Marxist nor radical feminist points of view have tended to embrace the status of a partial explanation; both were regularly constituted as totalities. Western explanation has demanded as much; how else could the 'Western' author incorporate its others? Each tried to annex other forms of domination by expanding its basic categories through analogy, simple listing, or addition. Embarrassed silence about race among white radical and socialist feminists was one major, devastating political consequence. History and polyvocality disappear into political taxonomies that try to establish genealogies. There was no structural room for race (or for much else) in theory claiming to reveal the construction of the category woman and social group women as a unified or totalizable whole. The structure of my caricature looks like this:

socialist feminism - structure of class // wage labour // alienation
labour, by analogy reproduction, by extension sex, by addition race
radical feminism - structure of gender // sexual appropriation //
objectification
sex, by analogy labour, by extension reproduction, by addition race

In another context, the French theorist, Julia Kristeva, claimed women appeared as a historical group after the Second World War, along with groups like youth. Her dates are doubtful; but we are now accustomed to remembering that as objects of knowledge and as historical actors, 'race' did not always exist, 'class' has a historical genesis, and 'homosexuals' are quite junior. It is no accident that the symbolic system of the family of man - and so the essence of woman - breaks up at the same moment that networks of connection among people on the planet are unprecedentedly multiple, pregnant, and complex. 'Advanced capitalism' is inadequate to convey the structure of this historical moment. In the 'Western' sense, the end of man is at stake. It is no accident that woman disintegrates into women in our time. Perhaps socialist feminists were not substantially guilty of producing essentialist theory that suppressed women's particularity and contradictory interests. I think we have been, at least through unreflective participation in the logics, languages, and practices of white humanism and through searching for a single ground of domination to secure our revolutionary voice. Now we have less excuse. But in the consciousness of our failures, we risk lapsing into boundless difference and giving up on the confusing task of making partial, real connection. Some differences are playful; some are poles of world historical systems of domination. 'Epistemology' is about knowing the difference.

THE INFORMATICS OF DOMINATION

In this attempt at an epistemological and political position, I would like to sketch a picture of possible unity, a picture indebted to socialist and feminist principles of design. The frame for my sketch is set by the extent and importance of rearrangements in world-wide social relations tied to science and technology. I argue for a politics rooted in claims about fundamental changes in the nature of class, race, and gender in an emerging system of world order analogous in its novelty and scope to that created by industrial capitalism; we are living through a movement from an organic, industrial society to a polymorphous, information system - from all work to all play, a deadly game. Simultaneously material and ideological, the dichotomies may be expressed in the following chart of transitions from the comfortable old hierarchical dominations to the scary new networks I have called the informatics of domination:

<table>
<thead>
<tr>
<th>Representation</th>
<th>Simulation</th>
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<tbody>
<tr>
<td>Bourgeois novel, realism</td>
<td>Science fiction, postmodernism</td>
</tr>
<tr>
<td>Organism</td>
<td>Biotic component</td>
</tr>
<tr>
<td>Depth, integrity</td>
<td>Surface, boundary</td>
</tr>
<tr>
<td>Heart</td>
<td>Noise</td>
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<tr>
<td>Biology as clinical practice</td>
<td>Biology as inscription</td>
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<tr>
<td>Physiology</td>
<td>Communications engineering</td>
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<td>Small group</td>
<td>Subsystem</td>
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<td>Perfection</td>
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<td>Eugenics</td>
<td>Population Control</td>
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<td>Decadence, Magic Mountain</td>
<td>Obsolescence, Future Shock</td>
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<td>Hygiene</td>
<td>Stress Management</td>
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<td>Microbiology, tuberculosis</td>
<td>Immunology, AIDS</td>
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<td>Organic division of labour</td>
<td>Ergonomics / cybernetics of labour</td>
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<td>Functional specialization</td>
<td>Modular construction</td>
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<td>Reproduction</td>
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<td>Organic sex role specialization</td>
<td>Optimal genetic strategies</td>
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<td>Biological determinism</td>
<td>Evolutionary inertia, constraints</td>
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<td>Community ecology</td>
<td>Ecosystem</td>
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<td>Racial chain of being</td>
<td>Neo-imperialism, United Nations humanism</td>
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Scientific management in home / factory  
Family / Market / Factory  
Family wage  
Public / Private  
Nature / Culture  
Co-operation  
Sex  
Labour  
Mind  
Second World War  
White Capitalist Patriarchy

Global factory / Electronic cottage  
Women in the Integrated Circuit  
Comparable worth  
Cyborg citizenship  
Fields of difference  
Communications enhancement  
Lacan  
Genetic engineering  
Robotics  
Artificial Intelligence  
Star Wars  
Informatics of Domination

This list suggests several interesting things. First, the objects on the right-hand side cannot be coded as 'natural', a realization that subverts naturalistic coding for the left-hand side as well. We cannot go back ideologically or materially. It's not just that 'god' is dead; so is the 'goddess'. Or both are reified in the worlds charged with microelectronic and biotechnological politics. In relation to objects like biotic components, one must think not in terms of essential properties, but in terms of design, boundary constraints, rates of flows, systems logics, costs of lowering constraints. Sexual reproduction is one kind of reproductive strategy among many, with costs and benefits as a function of the system environment. Ideologies of sexual reproduction can no longer reasonably call on notions of sex and sex role as organic aspects in natural objects like organisms and families. Such reasoning will be unmasked as irrational, and ironically corporate executives reading *Playboy* and anti-porn radical feminists will make strange bedfellows in jointly unmasking the irrationalism.

Likewise for race, ideologies about human diversity have to be formulated in terms of frequencies of parameters, like blood groups or intelligence scores. It is 'irrational' to invoke concepts like primitive and civilized. For liberals and radicals, the search for integrated social systems gives way to a new practice called 'experimental ethnography' in which an organic object dissipates in attention to the play of writing. At the level of ideology, we see translations of racism and colonialism into languages of development and under-development, rates and constraints of modernization. Any objects or persons can be reasonably thought of in terms of disassembly and reassembly; no 'natural' architectures constrain system design. The financial districts in all the world's cities, as well as the export-processing and free-trade zones, proclaim this elementary fact of 'late capitalism'. The entire universe of objects that can be known scientifically must be formulated as problems in communications engineering (for the managers) or theories of the text (for those who would resist). Both are cyborg semiotics.

One should expect control strategies to concentrate on boundary conditions and interfaces, on rates of flow across boundaries – and not on the integrity of natural objects. 'Integrity' or 'sincerity' of the Western self gives way to decision procedures and expert systems. For example, control strategies applied to women's capacities to give birth to new human beings will be developed in the languages of population control and maximization of goal achievement for individual decision-makers. Control strategies will be formulated in terms of rates, costs of constraints, degrees of freedom. Human beings, like any other component or subsystem, must be localized in a system architecture whose basic modes of operation are probabilistic, statistical. No objects, spaces, or bodies are sacred in themselves; any component can be interfaced with any other if the proper standard, the proper code, can be constructed for processing signals in a common language. Exchange in this world transcends the universal translation effected by capitalist markets that Marx analysed so well. The privileged pathology affecting all kinds of components in this universe is stress – communications breakdown (Hogness, 1983). The cyborg is not subject to Foucault's biopolitics; the cyborg simulates politics, a much more potent field of operations.

This kind of analysis of scientific and cultural objects of knowledge which have appeared historically since the Second World War prepares us to notice some important inadequacies in feminist analysis which has proceeded as if the organic, hierarchical dualisms ordering discourse in 'the West' since Aristotle still ruled. They have been cannibalized, or as Zoe Sofia (Sofoulis) might put it, they have been 'techno-digested'. The dichotomies between mind and body, animal and human, organism and machine, public and private, nature and culture, men and women, primitive and civilized are all in question ideologically. The actual situation of women is their integration/exploitation into a world system of production/reproduction and communication called the informatics of domination. The home, workplace, market, public arena, the body itself – all can be dispersed and interfaced in nearly infinite, polymorphous ways, with large consequences for women and others – consequences that themselves are very different for different people and which make potent oppositional international movements difficult to imagine and essential for survival. One important route for reconstructing social/labor-feminist politics is through theory and practice addressed to the social relations of science and technology, including crucially the systems of myth and meanings structuring our imaginations. The cyborg is a kind of disassembled and reassembled, postmodern collective and personal self. This is the self feminists must code.
Communications technologies and biotechnologies are the crucial tools recruiting our bodies. These tools embody and enforce new social relations for women world-wide. Technologies and scientific discourses can be partially understood as formalizations, i.e., as frozen moments, of the fluid social interactions constituting them, but they should also be viewed as instruments for enforcing meanings. The boundary is permeable between tool and myth, instrument and concept, historical systems of social relations and historical anatomies of possible bodies, including objects of knowledge. Indeed, myth and tool mutually constitute each other.

Furthermore, communications sciences and modern biologies are constructed by a common move – *the translation of the world into a problem of coding*, a search for a common language in which all resistance to instrumental control disappears and all heterogeneity can be submitted to disassembly, reassembly, investment, and exchange.

In communications sciences, the translation of the world into a problem in coding can be illustrated by looking at cybernetic (feedback-controlled) systems theories applied to telephone technology, computer design, weapons deployment, or data base construction and maintenance. In each case, solution to the key questions rests on a theory of language and control; the key operation is determining the rates, directions, and probabilities of flow of a quantity called information. The world is subdivided by boundaries differentially permeable to information. Information is just that kind of quantifiable element (unit, basis of unity) which allows universal translation, and so unhindered instrumental power (called effective communication). The biggest threat to such power is interruption of communication. Any system breakdown is a function of stress. The fundamentals of this technology can be condensed into the metaphor C^H, command-control-communication-intelligence, the military’s symbol for its operations theory.

In modern biologies, the translation of the world into a problem in coding can be illustrated by molecular genetics, ecology, sociobiological evolutionary theory, and immunobiology. The organism has been translated into problems of genetic coding and read-out. Biotechnology, a writing technology, informs research broadly. In a sense, organisms have ceased to exist as objects of knowledge, giving way to biotic components, i.e., special kinds of information-processing devices. The analogous moves in ecology could be examined by probing the history and utility of the concept of the ecosystem. Immunobiology and associated medical practices are rich exemplars of the privilege of coding and recognition systems as objects of knowledge, as constructions of bodily reality for us. Biology here is a kind of cryptography. Research is necessarily a kind of intelligence activity. Ironies abound. A stressed system goes awry; its communication processes break down; it fails to recognize the difference between self and other. Human babies with baboon hearts evoke national ethical perplexity – for animal rights activists at least as much as for the guardians of human purity. In the US gay men and intravenous drug users are the ’privileged’ victims of an awful immune system disease that marks (inscribes on the body) confusion of boundaries and moral pollution (Treichler, 1987).

But these excursions into communications sciences and biology have been at a rarefied level; there is a mundane, largely economic reality to support my claim that these sciences and technologies indicate fundamental transformations in the structure of the world for us. Communications technologies depend on electronics. Modern states, multinational corporations, military power, welfare state apparatuses, satellite systems, political processes, fabrication of our imaginations, labour-control systems, medical constructions of our bodies, commercial pornography, the international division of labour, and religious evangelism depend intimately upon electronics. Microelectronics is the technical basis of simulacra; that is, of copies without originals.

Microelectronics mediates the translations of labour into robotics and word processing, sex into genetic engineering and reproductive technologies, and mind into artificial intelligence and decision procedures. The new biotechnologies concern more than human reproduction. Biology as a powerful engineering science for redesigning materials and processes has revolutionary implications for industry, perhaps most obvious today in areas of fermentation, agriculture, and energy. Communications sciences and biology are constructions of natural-technical objects of knowledge in which the difference between machine and organism is thoroughly blurred; mind, body, and tool are on very intimate terms. The ‘multinational’ material organization of the production and reproduction of daily life and the symbolic organization of the production and reproduction of culture and imagination seem equally implicated. The boundary-maintaining images of base and superstructure, public and private, or material and ideal never seemed more feble.

I have used Rachel Grossman’s (1980) image of women in the integrated circuit to name the situation of women in a world so intimately restructured through the social relations of science and technology. I used the odd circumlocution, ‘the social relations of science and technology’, to indicate that we are not dealing with a technological determinism, but with a historical system depending upon structured relations among people. But the phrase should also indicate that science and technology provide fresh sources of power, that we need fresh sources of analysis and political action (Latour, 1984). Some of the rearrangements of race, sex, and class rooted in high-tech-facilitated social relations can make socialist-feminism more relevant to effective progressive politics.
THE 'HOMEWORK ECONOMY' OUTSIDE 'THE HOME'

The 'New Industrial Revolution' is producing a new world-wide working class, as well as new sexualities and ethnicities. The extreme mobility of capital and the emerging international division of labour are intertwined with the emergence of new collectivities, and the weakening of familiar groupings. These developments are neither gender- nor race-neutral. White men in advanced industrial societies have become newly vulnerable to permanent job loss, and women are not disappearing from the job rolls at the same rates as men. It is not simply that women in Third World countries are the preferred labour force for the science-based multinationals in the export-processing sectors, particularly in electronics. The picture is more systematic and involves reproduction, sexuality, culture, consumption, and production. In the prototypical Silicon Valley, many women's lives have been structured around employment in electronics-dependent jobs, and their intimate realities include serial heterosexual monogamy, negotiating childcare, distance from extended kin or most other forms of traditional community, a high likelihood of loneliness and extreme economic vulnerability as they age. The ethnic and racial diversity of women in Silicon Valley structures a microcosm of conflicting differences in culture, family, religion, education, and language.

Richard Gordon has called this new situation the 'homework economy'. Although he includes the phenomenon of literal homework emerging in connection with electronics assembly, Gordon intends 'homework economy' to name a restructuring of work that broadly has the characteristics formerly ascribed to female jobs, jobs literally done only by women. Work is being redefined as both literally female and feminized, whether performed by men or women. To be feminized means to be made extremely vulnerable; able to be disassembled, reassembled, exploited as a reserve labour force; seen less as workers than as servers; subjected to time arrangements on and off the paid job that make a mockery of a limited work day; leading an existence that always borders on being obscene, out of place, and reducible to sex. Deskilling is an old strategy newly applicable to formerly privileged workers. However, the homework economy does not refer only to large-scale deskilling, nor does it deny that new areas of high skill are emerging, even for women and men previously excluded from skilled employment. Rather, the concept indicates that factory, home, and market are integrated on a new scale and that the places of women are crucial — and need to be analysed for differences among women and for meanings for relations between men and women in various situations.

The homework economy as a world capitalist organizational structure is made possible by (not caused by) the new technologies. The success of the attack on relatively privileged, mostly white, men's unionized jobs is tied to the power of the new communications technologies to integrate and control labour despite extensive dispersion and decentralization. The consequences of the new technologies are felt by women both in the loss of the family (male) wage (if they ever had access to this white privilege) and in the character of their own jobs, which are becoming capital-intensive; for example, office work and nursing.

The new economic and technological arrangements are also related to the collapsing welfare state and the ensuing intensification of demands on women to sustain daily life for themselves as well as for men, children, and old people. The feminization of poverty — generated by dismantling the welfare state, by the homework economy where stable jobs become the exception, and sustained by the expectation that women's wages will not be matched by a male income for the support of children — has become an urgent focus. The causes of various women-headed households are a function of race, class, or sexuality; but their increasing generality is a ground for coalitions of women on many issues. That women regularly sustain daily life partly as a function of their enforced status as mothers is hardly new; the kind of integration with the overall capitalist and progressively war-based economy is new. The particular pressure, for example, on US black women, who have achieved an escape from (barely) paid domestic service and who now hold clerical and similar jobs in large numbers, has large implications for continued enforced black poverty with employment. Teenage women in industrializing areas of the Third World increasingly find themselves the sole or major source of a cash wage for their families, while access to land is ever more problematic. These developments must have major consequences in the psychodynamics and politics of gender and race.

Within the framework of three major stages of capitalism (commercial/early industrial, monopoly, multinational) — tied to nationalism, imperialism, and multinationalism, and related to Jameson's three dominant aesthetic periods of realism, modernism, and postmodernism — I would argue that specific forms of families dialectically relate to forms of capital and to its political and cultural concomitants. Although lived problematically and unequally, ideal forms of these families might be schematized as (1) the patriarchal nuclear family, structured by the dichotomy between public and private and accompanied by the white bourgeois ideology of separate spheres and nineteenth-century Anglo-American bourgeois feminisms; (2) the modern family mediated (or enforced) by the welfare state and institutions like the family wage, with a flowering of a-feminist heterosexual ideologies, including their radical versions represented in Greenwich Village around the First World War; and (3) the 'family' of the homework economy with its oxymoronic structure of women-headed households and its explosion of feminisms and the paradoxical intensification and erosion of gender itself.
This is the context in which the projections for world-wide structural unemployment stemming from the new technologies are part of the picture of the homework economy. As robotics and related technologies put men out of work in 'developed' countries and exacerbate failure to generate male jobs in Third World 'development', and as the automated office becomes the rule even in labour-surplus countries, the feminization of work intensifies. Black women in the United States have long known what it looks like to face the structural underemployment ('feminization') of black men, as well as their own highly vulnerable position in the wage economy. It is no longer a secret that sexuality, reproduction, family, and community life are interwoven with this economic structure in myriad ways which have also differentiated the situations of white and black women. Many more women and men will contend with similar situations, which will make cross-gender and race alliances on issues of basic life support (with or without jobs) necessary, not just nice.

The new technologies also have a profound effect on hunger and on food production for subsistence world-wide. Rae Lessor Blumberg (1983) estimates that women produce about 50 per cent of the world's subsistence food. 17 Women are excluded generally from benefiting from the increased high-tech commodification of food and energy crops, their days are made more arduous because their responsibilities to provide food do not diminish, and their reproductive situations are made more complex. Green Revolution technologies interact with other high-tech industrial production to alter gender divisions of labour and differential gender migration patterns.

The new technologies seem deeply involved in the forms of 'privatization' that Ros Petchesky (1981) has analysed, in which militarization, right-wing family ideologies and policies, and intensified definitions of corporate (and state) property as private synergistically interact. 18 The new communications technologies are fundamental to the eradication of 'public life' for everyone. This facilitates the mushrooming of a permanent high-tech military establishment at the cultural and economic expense of most people, but especially of women. Technologies like video games and highly miniaturized televisions seem crucial to production of modern forms of 'private life'. The culture of video games is heavily orientated to individual competition and extraterrestrial warfare. High-tech, gendered imaginations are produced here, imaginations that can contemplate destruction of the planet and a sci-fi escape from its consequences. More than our imaginations is militarized; and the other realities of electronic and nuclear warfare are inescapable. These are the technologies that promise ultimate mobility and perfect exchange – and incidentally enable tourism, that perfect practice of mobility and exchange, to emerge as one of the world's largest single industries.

The new technologies affect the social relations of both sexuality and of reproduction, and not always in the same ways. The close ties of sexuality and instrumentality, of views of the body as a kind of private satisfaction- and utility-maximizing machine, are described nicely in sociobiological origin stories that stress a genetic calculus and explain the inevitable dialectic of domination of male and female gender roles. 19 These sociobiological stories depend on a high-tech view of the body as a biotic component or cybernetic communications system. Among the many transformations of reproductive situations is the medical one, where women's bodies have boundaries newly permeable to both 'visualization' and 'intervention'. Of course, who controls the interpretation of bodily boundaries in medical hermeneutics is a major feminist issue. The speculum served as an icon of women's claiming their bodies in the 1970s; that handcraft tool is inadequate to express our needed body politics in the negotiation of reality in the practices of cyborg reproduction. Self-help is not enough. The technologies of visualization recall the important cultural practice of hunting with the camera and the deeply predatory nature of a photographic consciousness. 20 Sex, sexuality, and reproduction are central actors in high-tech myth systems structuring our imaginations of personal and social possibility.

Another critical aspect of the social relations of the new technologies is the reformulation of expectations, culture, work, and reproduction for the large scientific and technical work-force. A major social and political danger is the formation of a strongly bimodal social structure, with the masses of women and men of all ethnic groups, but especially people of colour, confined to a homework economy, illiteracy of several varieties, and general redundancy and impotence, controlled by high-tech repressive apparatuses ranging from entertainment to surveillance and disappearance. An adequate socialist-feminist politics should address women in the privileged occupational categories, and particularly in the production of science and technology that constructs scientific-technical discourses, processes, and objects. 21

This issue is only one aspect of enquiry into the possibility of a feminist science, but it is important. What kind of constitutive role in the production of knowledge, imagination, and practice can new groups doing science have? How can these groups be allied with progressive social and political movements? What kind of political accountability can be constructed to tie women together across the scientific-technical hierarchies separating us? Might there be ways of developing feminist science/technology politics in alliance with anti-military science facility conversion action groups? Many scientific and technical workers in Silicon Valley, the high-tech cowboys included, do not want to work on military science. 22 Can these personal preferences and cultural tendencies be welded into progressive politics among this professional middle class in which women, including women of colour, are coming to be fairly numerous?
WOMEN IN THE INTEGRATED CIRCUIT

Let me summarize the picture of women's historical locations in advanced industrial societies, as these positions have been restructured partly through the social relations of science and technology. If it was ever possible ideologically to characterize women's lives by the distinction of public and private domains—suggested by images of the division of working-class life into factory and home, of bourgeois life into market and home, and of gender existence into personal and political realms—it is now a totally misleading ideology, even to show how both terms of these dichotomies construct each other in practice and in theory. I prefer a network ideological image, suggesting the profusion of spaces and identities and the permeability of boundaries in the personal body and in the body politic. 'Networking' is both a feminist practice and a multinational corporate strategy—weaving is for oppositional cyborgs.

So let me return to the earlier image of the informatics of domination and trace one vision of women's 'place' in the integrated circuit, touching only a few idealized social locations seen primarily from the point of view of advanced capitalist societies: Home, Market, Paid Work Place, State, School, Clinic-Hospital, and Church. Each of these idealized spaces is logically and practically implied in every other locus, perhaps analogous to a holographic photograph. I want to suggest the impact of the social relations mediated and enforced by the new technologies in order to help formulate needed analysis and practical work. However, there is no 'place' for women in these networks, only geometries of difference and contradiction crucial to women's cyborg identities. If we learn how to read these webs of power and social life, we might learn new couplings, new coalitions. There is no way to read the following list from a standpoint of 'identification', of a unitary self. The issue is dispersion. The task is to survive in the diaspora.

Home: Women-headed households, serial monogamy, flight of men, old women alone, technology of domestic work, paid homework, re-emergence of home sweat-shops, home-based businesses and telecommuting, electronic cottage, urban homelessness, migration, module architecture, reinforced (simulated) nuclear family, intense domestic violence.

Market: Women's continuing consumption work, newly targeted to buy the profusion of new production from the new technologies (especially as the competitive race among industrialized and industrializing nations to avoid dangerous mass unemployment necessitates finding ever bigger new markets for ever less clearly needed commodities); bimodal buying power, coupled with advertising targeting of the numerous affluent groups and neglect of the previous mass markets; growing importance of informal markets in labour and commodities parallel to high-tech, affluent market structures; surveillance systems through electronic funds transfer; intensified market abstraction (commodification) of experience, resulting in ineffective utopian or equivalent cynical theories of community; extreme mobility (abstraction) of marketing/financing systems; inter-penetration of sexual and labour markets; intensified sexualization of abstracted and alienated consumption.

Paid Work Place: Continued intense sexual and racial division of labour, but considerable growth of membership in privileged occupational categories for many white women and people of colour; impact of new technologies on women's work in clerical, service, manufacturing (especially textiles), agriculture, electronics; international restructuring of the working classes; development of new time arrangements to facilitate the homework economy (flex time, part time, over time, no time); homework and out work; increased pressures for two-tiered wage structures; significant numbers of people in cash-dependent populations world-wide with no experience or no further hope of stable employment; most labour 'marginal' or 'feminised'.

State: Continued erosion of the welfare state; decentralizations with increased surveillance and control; citizenship by telematics; imperialism and political power broadly in the form of information rich/information poor differentiation; increased high-tech militarization increasingly opposed by many social groups; reduction of civil service jobs as a result of the growing capital intensification of office work, with implications for occupational mobility for women of colour; growing privatization of material and ideological life and culture; close integration of privatization and militarization, the high-tech forms of bourgeois capitalist personal and public life; invisibility of different social groups to each other, linked to psychological mechanisms of belief in abstract enemies.

School: Deepening coupling of high-tech capital needs and public education at all levels, differentiated by race, class, and gender; managerial classes involved in educational reform and refunding at the cost of remaining progressive educational democratic structures for children and teachers; education for mass ignorance and repression in technocratic and militarized culture; growing anti-science mystery cults in dissenting and radical political movements; continued relative scientific illiteracy among white women and people of colour; growing industrial direction of education (especially higher education) by science-based multinationals (particularly in electronics- and biotechnology-dependent companies); highly educated, numerous elites in a progressively bimodal society.

Clinic-Hospital: Intensified machine–body relations; renegotiations of
The importance of health; particularly the struggles of women's reproductive processes; the failures of reproductive politics in response to world historical implications of women's unrealized, potential control of their relation to reproduction; emergence of new, historically specific diseases; struggles over meanings and means of health in environments pervaded by high technology products and processes; continuing feminization of health work; intensified struggle over state responsibility for health; continued ideological role of popular health movements as a major form of American politics.

Church: Electronic fundamentalist 'super-saver' preachers solemnizing the union of electronic capital and automated fetish gods; intensified importance of churches in resisting the militarized state; central struggle over women's meanings and authority in religion; continued relevance of spirituality, interwoven with sex and health, in political struggle.

The only way to characterize the informatics of domination is as a massive intensification of insecurity and cultural impoverishment, with common failure of subsistence networks for the most vulnerable. Since much of this picture interweaves with the social relations of science and technology, the urgency of a socialist-feminist politics addressed to science and technology is plain. There is much now being done, and the grounds for political work are rich. For example, the efforts to develop forms of collective struggle for women in paid work, like SEIU's District 925,* should be a high priority for all of us. These efforts are profoundly tied to technical restructuring of labour processes and reformations of working classes. These efforts also are providing understanding of a more comprehensive kind of labour organization, including community, sexuality, and family issues never privileged in the largely white male industrial unions.

The structural rearrangements related to the social relations of science and technology evoke strong ambivalence. But it is not necessary to be ultimately depressed by the implications of late twentieth-century women's relation to all aspects of work, culture, production of knowledge, sexuality, and reproduction. For excellent reasons, most Marxisms see domination best and have trouble understanding what can only look like false consciousness and people's complicity in their own domination in late capitalism. It is crucial to remember that what is lost, perhaps especially from women's points of view, is often virulent forms of oppression, nostalgically naturalized in the face of current violation. Ambivalence towards the disrupted unities mediated by high-tech culture requires not sorting consciousness into categories of 'clear-sighted critique grounding a solid political epistemology' versus 'manipulated false consciousness', but subtle understanding of emerging pleasures, experiences, and powers with serious potential for changing the rules of the game.

There are grounds for hope in the emerging bases for new kinds of unity across race, gender, and class, as these elementary units of socialist-feminist analysis themselves suffer protean transformations. Intensifications of hardship experienced world-wide in connection with the social relations of science and technology are severe. But what people are experiencing is not transparently clear, and we lack sufficiently subtle connections for collectively building effective theories of experience. Present efforts – Marxist, psychoanalytic, feminist, anthropological – to clarify even 'our' experience are rudimentary.

I am conscious of the odd perspective provided by my historical position – a PhD in biology for an Irish Catholic girl was made possible by Sputnik's impact on US national science-education policy. I have a body and mind as much constructed by the post-Second World War arms race and cold war as by the women's movements. There are more grounds for hope in focusing on the contradictory effects of politics designed to produce loyal American technocrats, which also produced large numbers of dissidents, than in focusing on the present defeats.

The permanent partiality of feminist points of view has consequences for our expectations of forms of political organization and participation. We do not need a totality in order to work well. The feminist dream of a common language, like all dreams for a perfectly true language, of perfectly faithful naming of experience, is a totalizing and imperialist one. In that sense, dialectics too is a dream language, longing to resolve contradiction. Perhaps, ironically, we can learn from our fusions with animals and machines how not to be Man, the embodiment of Western logos. From the point of view of pleasure in these potent and taboo fusions, made inevitable by the social relations of science and technology, there might indeed be a feminist science.

CYBORGS: A MYTH OF POLITICAL IDENTITY
I want to conclude with a myth about identity and boundaries which might inform late twentieth-century political imaginations (Plate 1). I am indebted in this story to writers like Joanna Russ, Samuel R. Delany, John Varley, James Tiptree, Jr, Octavia Butler, Monique Wittig, and Vonda McIntyre. These are our story-tellers exploring what it means to be embodied in high-tech worlds. They are theorists for cyborgs. Exploring conceptions of bodily boundaries and social order, the anthropologist Mary Douglas (1966, 1970) should be credited with helping us to consciousness about how fundamental body imagery is to world view, and so to political language.
French feminists like Luce Irigaray and Monique Wittig, for all their differences, know how to write the body; how to weave eroticism, cosmology, and politics from imagery of embodiment, and especially for Wittig, from imagery of fragmentation and reconstitution of bodies.24

American radical feminists like Susan Griffin, Audre Lorde, and Adrienne Rich have profoundly affected our political imaginations – and perhaps restricted too much what we allow as a friendly body and political language.25 They insist on the organic, opposing it to the technological. But their symbolic systems and the related positions of ecofeminism and feminist paganism, replete with organisms, can only be understood in Sandoval’s terms as oppositional ideologies fitting the late twentieth century. They would simply bewildered anyone not preoccupied with the machines and consciousness of late capitalism. In that sense they are part of the cyborg world. But there are also great riches for feminists in explicitly embracing the possibilities inherent in the breakdown of clean distinctions between organism and machine and similar distinctions structuring the Western self. It is the simultaneity of breakdowns that cracks the matrices of domination and opens geometric possibilities. What might be learned from personal and political ‘technological’ pollution? I look briefly at two overlapping groups of texts for their insight into the construction of a potentially helpful cyborg myth: constructions of women of colour and monstrous selves in feminist science fiction.

Earlier I suggested that ‘women of colour’ might be understood as a cyborg identity, a potent subjectivity synthesized from fusions of outsider identities and in the complex political-historical layerings of her ‘biomythography’, Zami (Lorde, 1982; King, 1987a, 1987b). There are material and cultural grids mapping this potential, Audre Lorde (1984) captures the tone in the title of her Sister Outsider. In my political myth, Sister Outsider is the offshore woman, whom US workers, female and feminized, are supposed to regard as the enemy preventing their solidarity, threatening their security. Onshore, inside the boundary of the United States, Sister Outsider is a potential amidst the races and ethnic identities of women manipulated for division, competition, and exploitation in the same industries. ‘Women of colour’ are the preferred labour force for the science-based industries, the real women for whom the world-wide sexual market, labour market, and politics of reproduction kaleidoscope into daily life. Young Korean women hired in the sex industry and in electronics assembly are recruited from high schools, educated for the integrated circuit. Literacy, especially in English, distinguishes the ‘cheap’ female labour so attractive to the multinationals.

Contrary to orientalist stereotypes of the ‘oral primitive’, literacy is a special mark of women of colour, acquired by US black women as well as men through a history of risking death to learn and to teach reading and writing. Writing has a special significance for all colonized groups. Writing has been crucial to the Western myth of the distinction between oral and written cultures, primitive and civilized mentalities, and more recently to the erosion of that distinction in ‘postmodernist’ theories attacking the phallogcentrism of the West, with its worship of the monotheistic, phallic, authoritative, and singular work, the unique and perfect name.26 Contests for the meanings of writing are a major form of contemporary political struggle. Releasing the play of writing is deadly serious. The poetry and stories of US women of colour are repeatedly about writing, about access to the power to signify; but this time that power must be neither phallic nor innocent. Cyborg writing must not be about the Fall, the imagination of a once-upon-a-time wholeness before language, before writing, before Man. Cyborg writing is about the power to survive, not on the basis of original innocence, but on the basis of seizing the tools to mark the world that marked them as other.

The tools are often stories, retold stories, versions that reverse and displace the hierarchical dualisms of naturalized identities. In retelling origin stories, cyborg authors subvert the central myths of origin of Western culture. We have all been colonized by those origin myths, with their longing for fulfilment in apocalypse. The phallogcentric origin stories most crucial for feminist cyborgs are built into the literal technologies – technologies that write the world, biotechnology and microelectronics – that have recently textualized our bodies as code problems on the grid of C3. Feminist cyborg stories have the task of recoding communication and intelligence to subvert command and control.

Figuratively and literally, language politics pervade the struggles of women of colour; and stories about language have a special power in the rich contemporary writing by US women of colour. For example, retellings of the story of the indigenous woman Malinche, mother of the mestizo ‘bastard’ race of the new world, master of languages, and mistress of Cortés, carry special meaning for Chicana constructions of identity. Cherríe Moraga (1983) in Loving in the War Years explores the themes of identity when one never possessed the original language, never told the original story, never resided in the harmony of legitimate heterosexuality in the garden of culture, and so cannot base identity on a myth or a fall from innocence and right to natural names, mother’s or father’s.27 Moraga’s writing, her superb literacy, is presented in her poetry as the same kind of violation as Malinche’s mastery of the conqueror’s language – a violation, an illegitimate production, that allows survival. Moraga’s language is not ‘whole’; it is self-consciously spliced, a chimera of English and Spanish, both conquoror’s languages. But it is this chimeric monster, without claim to an original language before
violation, that crafts the erotic, competent, potent identities of women of colour. Sister Outsider hints at the possibility of world survival not because of her innocence, but because of her ability to live on the boundaries, to write without the founding myth of original wholeness, with its inescapable apocalypse of final return to a deathly oneness that Man has imagined to be the innocent and all-powerful Mother, freed at the End from another spiral of appropriation by her son. Writing marks Moraga’s body, affirms it as the body of a woman of colour, against the possibility of passing into the unmarked category of the Anglo father or into the orientalist myth of ‘original illiteracy’ of a mother that never was. Malinche was mother here, not Eve before eating the forbidden fruit. Writing affirms Sister Outsider, not the Woman-before-the-Fall-into-Writing needed by the phallogocentric Family of Man.

Writing is pre-eminently the technology of cyborgs, etched surfaces of the late twentieth century. Cyborg politics is the struggle for language and the struggle against perfect communication, against the one code that translates all meaning perfectly, the central dogma of phallogocentrism. That is why cyborg politics insist on noise and advocate pollution, rejoicing in the illegitimate fusions of animal and machine. These are thecouplings which make Man and Woman so problematic, subverting the structure of desire, the force imagined to generate language and gender, and so subverting the structure and modes of reproduction of ‘Western’ identity, of nature and culture, of mirror and eye, slave and master, body and mind. ‘We’ did not originally choose to be cyborgs, but choice grounds a liberal politics and epistemology that imagines the reproduction of individuals before the wider replications of ‘texts’.

From the perspective of cyborgs, freed of the need to ground politics in ‘our’ privileged position of the oppression that incorporates all other dominations, the innocence of the merely violated, the ground of those closer to nature, we can see powerful possibilities. Feminisms and Marxisms have run aground on Western epistemological imperatives to construct a revolutionary subject from the perspective of a hierarchy of oppressions and/or a latent position of moral superiority, innocence, and greater closeness to nature. With no available original dream of a common language or original symbiosis promising protection from hostile ‘masculine’ separation, but written into the play of a text that has no finally privileged reading or salvation history, to recognize ‘oneself’ as fully implicated in the world, frees us of the need to root politics in identification, vanguard parties, purity, and mothering. Stripped of identity, the bastard race teaches about the power of the margins and the importance of a mother like Malinche. Women of colour have transformed her from the evil mother of masculinist fear into the originally literate mother who teaches survival.

This is not just literary deconstruction, but liminal transformation. Every story that begins with original innocence and privileges the return to wholeness imagines the drama of life to be individuation, separation, the birth of the self, the tragedy of autonomy, the fall into writing, alienation; that is, war, tempered by imaginary respite in the bosom of the Other. These plots are ruled by a reproductive politics – rebirth without flaw, perfection, abstraction. In this plot women are imagined either better or worse off, but all agree they have less selfhood, weaker individuation, more fusion to the oral, to Mother, less at stake in masculine autonomy. But there is another route to having less at stake in masculine autonomy, a route that does not pass through Woman, Primitive, Zero, the Mirror Stage and its imaginary. It passes through women and other present-tense, illegitimate cyborgs, not of Woman born, who refuse the ideological resources of victimization so as to have a real life. These cyborgs are the people who refuse to disappear on cue, no matter how many times a ‘Western’ commentator remarks on the sad passing of another primitive, another organic group done in by ‘Western’ technology, by writing. These real-life cyborgs (for example, the Southeast Asian village women workers in Japanese and US electronics firms described by Aihwa Ong) are actively rewriting the texts of their bodies and societies. Survival is the stakes in this play of readings.

To recapitulate, certain dualisms have been persistent in Western traditions; they have all been systemic to the logics and practices of domination of women, people of colour, nature, workers, animals – in short, domination of all constituted as others, whose task is to mirror the self. Chief among these troubling dualisms are self/other, mind/body, culture/nature, male/female, civilized/primitive, reality/appearance, whole/part, agent/resource, maker/made, active/passive, right/wrong, truth/illusion, total/partial, God/man. The self is the One who is not dominated, who knows that by the service of the other, the other is the One who holds the future, who knows that by the experience of domination, which gives the lie to the autonomy of the self. To be One is to be autonomous, to be powerful, to be God; but to be One is to be an illusion, and so to be involved in a dialectic of apocalypse with the other. Yet to be other is to be multiple, without clear boundary, frayed, insubstantial. One is too few, but two are too many.

High-tech culture challenges these dualisms in intriguing ways. It is not clear who makes who is made in the relation between human and machine. It is not clear what is mind and what body in machines that resolve into coding practices. In so far as we know ourselves in both formal discourse (for example, biology) and in daily practice (for example, the homework economy in the integrated circuit), we find ourselves to be cyborgs, hybrids, mosaics, chimeras. Biological organisms have become biotic systems, com-
communications devices like others. There is no fundamental, ontological separation in our formal knowledge of machine and organism, of technical and organic. The replicant Rachel in the Ridley Scott film Blade Runner stands as the image of a cyborg culture’s fear, love, and confusion. One consequence is that our sense of connection to our tools is heightened. The trance state experienced by many computer users has become a staple of science-fiction film and cultural jokes. Perhaps paraplegics and other severely handicapped people can (and sometimes do) have the most intense experiences of complex hybridization with other communication devices.22 Anne McCaffrey’s pre-feminist The Ship Who Sang (1966) explored the consciousness of a cyborg, hybrid of girl’s brain and complex machinery, formed after the birth of a severely handicapped child. Gender, sexuality, embodiment, skill: all were reconstituted in the story. Why should our bodies end at the skin, or include at best other beings encapsulated by skin? From the seventeenth century till now, machines could be animated—given ghostly souls to make them speak or move or to account for their orderly development and mental capacities. Or organisms could be mechanized—reduced to body understood as resource of mind. These machine/organism relationships are obsolete, unnecessary. For us, in imagination and in other practice, machines can be prosthetic devices, intimate components, friendly selves. We don’t need organic holism to give impermeable wholeness, the total woman and her feminist variants (mutants?). Let me conclude this point by a very partial reading of the logic of the cyborg monsters of my second group of texts, feminist science fiction.

The cyborgs populating feminist science fiction make very problematic the statuses of man or woman, human, artefact, member of a race, individual entity, or body. Katie King clarifies how pleasure in reading these fictions is not largely based on identification. Students facing Joanna Russ for the first time, students who have learned to take modernist writers like James Joyce or Virginia Woolf without flinching, do not know what to make of The Adventures of Abyx or The Female Man, where characters refuse the reader’s search for innocent wholeness while granting the wish for heroic quests, exuberant eroticism, and serious politics. The Female Man is the story of four versions of one genotype, all of whom meet, but even taken together do not make a whole, resolve the dilemmas of violent moral action, or remove the growing scandal of gender. The feminist science fiction of Samuel R. Delany, especially Tales of Nevrjon, mocks stories of origin by redoing the neolithic revolution, replaying the founding moves of Western civilization to subvert their plausibility. James Tiptree, Jr, an author whose fiction was regarded as particularly manly until her ‘true’ gender was revealed, tells tales of reproduction based on non-mammalian technologies like alternation of generations of male brood pouches and male nurturing. John Varley constructs a supreme cyborg in his arch-feminist exploration of Gaea, a mad goddess-planet-trickster-old woman-technological device on whose surface an extraordinary array of post-cyborg symbioses are spawned. Octavia Butler writes of an African sorceress pitting her powers of transformation against the genetic manipulations of her rival (Wild Seed), of time warps that bring a modern US black woman into slavery where her actions in relation to her white master-ancestor determine the possibility of her own birth (Kindred), and of the illegitimate insights into identity and community of an adopted cross-species child who came to know the enemy as self (Survivor). In Dawn (1987), the first instalment of a series called Xenogenesis, Butler tells the story of Lilith Iyapo, whose personal name recalls Adam’s first and repudiated wife and whose family name marks her status as the widow of the son of Nigerian immigrants to the US. A black woman and a mother whose child is dead, Lilith mediates the transformation of humanity through genetic exchange with extra-terrestrial lovers/rescuers/destroyers/genetic engineers, who reform earth’s habitats after the nuclear holocaust and coerce surviving humans into intimate fusion with them. It is a novel that interrogates reproductive, linguistic, and nuclear politics in a mythic field structured by late twentieth-century race and gender.

Because it is particularly rich in boundary transgressions, Vonda McIntyre’s Superluminal can close this truncated catalogue of promising and dangerous monsters who help redefine the pleasures and politics of embodiment and feminist writing. In a fiction where no character is ‘simply’ human, human status is highly problematic. Orca, a genetically altered diver, can speak with killer whales and survive deep ocean conditions, but she longs to explore space as a pilot, necessitating bionic implants jeopardizing her kinship with the divers and cetaceans. Transformations are effected by virus vectors carrying a new developmental code, by transplant surgery, by implants of microelectronic devices, by analogue doubles, and other means. Laenea becomes a pilot by accepting a heart implant and a host of other alterations allowing survival in transit at speeds exceeding that of light. Radu Dracul survives a virus-caused plague in his outerworld planet to find himself with a time sense that changes the boundaries of spatial perception for the whole species. All the characters explore the limits of language; the dream of communicating experience; and the necessity of limitation, partiality, and intimacy even in this world of protean transformation and connection. Superluminal stands also for the defining contradictions of a cyborg world in another sense; it embodies textually the intersection of feminist theory and colonial discourse in the science fiction I have alluded to in this chapter. This is a conjunction with a long history that many ‘First World’ feminists have tried to repress, including myself in my readings of Superluminal before being called to account by Zoe Sofoulis,
whose different location in the world system's informatics of domination made her acutely alert to the imperialist moment of all science fiction cultures, including women's science fiction. From an Australian feminist sensitivity, Sofoulis remembered more readily McIntrye's role as writer of the adventures of Captain Kirk and Spock in TV's *Star Trek* series than her rewriting the romance in *Superluminal*.

Monsters have always defined the limits of community in Western imaginations. The Centaurs and Amazons of ancient Greece established the limits of the centred polis of the Greek male human by their disruption of marriage and boundary pollutions of the warrior with animality and woman. Unseparated twins and hermaphrodites were the confused human material in early modern France who grounded discourse on the natural and supernatural, medical and legal, portents and diseases – all crucial to establishing modern identity. The evolutionary and behavioural sciences of monkeys and apes have marked the multiple boundaries of late twentieth-century industrial identities. Cyborg monsters in feminist science fiction define quite different political possibilities and limits from those proposed by the mundane fiction of *Man and Woman*.

There are several consequences to taking seriously the imagery of cyborgs as other than our enemies. Our bodies, ourselves; bodies are maps of power and identity. Cyborgs are no exception. A cyborg body is not innocent; it was not born in a garden; it does not seek unitary identity and so generate antagonistic dualisms without end (or until the world ends); it takes irony for granted. One is too few, and two is only one possibility. Intense pleasure in skill, machine skill, ceases to be a sin, but an aspect of embodiment. The machine is not an it to be animated, worshipped, and dominated. The machine is us, our processes, an aspect of our embodiment. We can be responsible for machines; they do not dominate or threaten us. We are responsible for boundaries; we are they. Up till now (once upon a time), female embodiment seemed to be given, organic, necessary; and female embodiment seemed to mean skill in mothering and its metaphorical extensions. Only by being out of place could we take intense pleasure in machines, and then with excuses that this was organic activity after all, appropriate to females. Cyborgs might consider more seriously the partial, fluid, sometimes aspect of sex and sexual embodiment. Gender might not be global identity after all, even if it has profound historical breadth and depth.

The ideologically charged question of what counts as daily activity, as experience, can be approached by exploiting the cyborg image. Feminists have recently claimed that women are given to dailiness, that women more than men somehow sustain daily life, and so have a privileged epistemological position potentially. There is a compelling aspect to this claim, one that makes visible unvalued female activity and names it as the ground of life.

But the ground of life? What about all the ignorance of women, all the exclusions and failures of knowledge and skill? What about men’s access to daily competence, to knowing how to build things, to take them apart, to play? What about other embodiments? Cyborg gender is a local possibility taking a global vengeance. Race, gender, and capital require a cyborg theory of wholes and parts. There is no drive in cyborgs to produce total theory, but there is an intimate experience of boundaries, their construction and deconstruction. There is a myth system waiting to become a political language to ground one way of looking at science and technology and challenging the informatics of domination – in order to act potently.

One last image: organisms and organismic, holistic politics depend on metaphors of rebirth and invariably call on the resources of reproductive sex. I would suggest that cyborgs have more to do with regeneration and are suspicious of the reproductive matrix and of most birthing. For salamanders, regeneration after injury, such as the loss of a limb, involves regrowth of structure and restoration of function with the constant possibility of twinning or other odd topographical productions at the site of former injury. The regrown limb can be monstrous, duplicated, potent. We have all been injured, profoundly. We require regeneration, not rebirth, and the possibilities for our reconstitution include the utopian dream of the hope for a monstrous world without gender.

Cyborg imagery can help express two crucial arguments in this essay: first, the production of universal, totalizing theory is a major mistake that misses most of reality, probably always, but certainly now; and second, taking responsibility for the social relations of science and technology means refusing an anti-science metaphysics, a demonology of technology, and so means embracing the skillful task of reconstructing the boundaries of daily life, in partial connection with others, in communication with all of our parts. It is not just that science and technology are possible means of great human satisfaction, as well as a matrix of complex domination. Cyborg imagery can suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves. This is a dream not of a common language, but of a powerful infidel heteroglossia. It is an imagination of a feminist speaking in tongues to strike fear into the circuits of the supervisors of the new right. It means both building and destroying machines, identities, categories, relationships, space stories. Though both are bound in the spiral dance, I would rather be a cyborg than a goddess.
biomedical language – with its stunning artefacts, images, architectures, social forms, and technologies – for shaping the unequal experience of sickness and death for millions is a social fact deriving from ongoing heterogeneous social processes. The power of biomedicine and biotechnology is constantly re-produced, or it would cease. This power is not a thing fixed and permanent, embedded in plastic and ready to section for microscopic observation by the historian or critic. The cultural and material authority of biomedicine’s productions of bodies and selves is more vulnerable, more dynamic, more elusive, and more powerful than that.

But if there has been recognition of the many non-, para-, anti-, or extra-scientific languages in company with biomedicine that structure the embodied semiosis of mortality in the industrialized world, it is much less common to find emphasis on the multiple languages within the territory that is often so glibly marked scientific. 'Science says' is represented as a univocal language. Yet even the spliced character of the potent words in ‘science’ hints at a barely contained and inharmonious heterogeneity. The words for the overlapping discourses and their objects of knowledge, and for the abstract corporate names for the concrete places where the discourse-building work is done, suggest both the blunt foreshortening of technicist approaches to communication and the uncontainable pressures and confusions at the boundaries of meanings within ‘science’ – biotechnology, biomedicine, psychoneuroimmunology, immunogenetics, immunoendocrinology, neuroendocrinology, monoclonal antibodies, hybridomas, interleukines, Genentech, Embrex, Immunotech, Biogen.

This chapter explores some of the contending popular and technical languages constructing biomedical, biotechnical bodies and selves in postmodern scientific culture in the United States in the 1980s. Scientific discourses are ‘lumpy’; they contain and enact condensed contestations for meanings and practices. The chief object of my attention will be the potent and polymorphous object of belief, knowledge, and practice called the immune system. My thesis is that the immune system is an elaborate icon for principal systems of symbolic and material ‘difference’ in late capitalism. Pre-eminently a twentieth-century object, the immune system is a map drawn to guide recognition and misrecognition of self and other in the dialectics of Western biopolitics. That is, the immune system is a plan for meaningful action to construct and maintain the boundaries for what may count as self and other in the crucial realms of the normal and the pathological. The immune system is a historically specific terrain, where global and local politics; Nobel Prize-winning research; heteroglossic cultural productions, from popular dietary practices, feminist science fiction, religious imagery, and children’s games, to photographic techniques and military strategic theory; clinical medical practice; venture capital investment strategies; world-changing developments in business and technology; and the deepest personal and collective experiences of embodiment, vulnerability, power, and mortality interact with an intensity matched perhaps only in the biopolitics of sex and reproduction.

The immune system is both an iconic mythic object in high-technology culture and a subject of research and clinical practice of the first importance. Myth, laboratory, and clinic are intimately interwoven. This mundane point was fortuitously captured in the title listings in the 1986–87 Books in Print, where I was searching for a particular undergraduate textbook on immunology. The several pages of entries beginning with the prefix ‘immuno-’ were bounded, according to the English rules of alphabetical listing, by a volume called Immortals of Science Fiction, near one end, and by The Immutability of God, at the other. Examining the last section of the textbook to which Books in Print led me, Immunology: A Synthesis (Golub, 1987), I found what I was looking for: a historical progression of diagrams of theories of immunological regulation and an obituary for their draftsman, an important immunologist, Richard K. Gershon, who ‘discovered’ the suppressor T cell. The standard obituary tropes for the scientist, who ‘must have had what the earliest explorers had, an insatiable desire to be the first person to see something, to know that you are where no man has been before’, set the tone. The hero-scientist ‘gloried in the layer upon interconnected layer of [the immune response’s] complexity. He thrilled at seeing a layer of that complexity which no one had seen before’ (Golub, 1987, pp. 531–2). It is reasonable to suppose that all the likely readers of this textbook have been reared within hearing range of the ringing tones of the introduction to the voyages of the federation starship Enterprise in Star Trek – to boldly go where no man has gone before. Science remains an important genre of Western exploration and travel literature. Similarly, no reader, no matter how literal-minded, could be innocent of the gendered erotic trope that figures the hero’s probing into nature’s laminated secrets, glorying simultaneously in the layered complexity and in his own techno-erotic touch that goes ever deeper. Science as heroic quest and as erotic technique applied to the body of nature are utterly conventional figures. They take on a particular edge in late twentieth-century immune system discourse, where themes of nuclear extermination, space adventure, extra-terrestrialism, exotic invaders, and military high-technology are pervasive.

But Golub’s and Gershon’s intended and explicit text is not about space invaders and the immune system as a Star Wars prototype. Their theme is the love of complexity and the intimate natural bodily technologies for generating the harmonies of organic life. In four illustrations – dated 1968, 1974, 1977, and 1982 – Gershon sketched his conception of ‘the immunological orchestra’ (Golub, 1987, pp. 533–6). This orchestra is a wonderful
picture of the mythic and technical dimensions of the immune system (Plates 3–6). All the illustrations are about co-operation and control, the major themes of organismic biology since the late eighteenth century. From his commanding position in the root of a lymph node, the G.O.D. of the first illustration conducts the orchestra of T and B cells and macrophages as they march about the body and play their specific parts (Plate 3). The lymphocytes all look like Casper the ghost with the appropriate distinguishing nuclear morphologies drawn in the centre of their shapeless bodies. Batin in hand, G.O.D.'s arms are raised in quotation of a symphonic conductor. G.O.D. recalls the other 1960s bioreligious, Nobel Prize-winning 'joke' about the coded bodily text of post-DNA biology and medicine — the Central Dogma of molecular biology, specifying that 'information' flows only from DNA to RNA to protein. These three were called the Blessed Trinity of the secularized sacred body, and histories of the great adventures of molecular biology could be titled The Eighth Day of Creation (Judson, 1979), an image that takes on a certain irony in the venture capital and political environments of current biotechnology companies, like Genentech. In the technomystic systems of molecular biology, code rules embodied structure and function, never the reverse. Genesis is a serious joke, when the body is theorized as a coded text whose secrets yield only to the proper reading conventions, and when the laboratory seems best characterized as a vast assemblage of technological and organic inscription devices. The Central Dogma was about a master control system for information flow in the codes that determine meaning in the great technological communication systems that organisms progressively have become after the Second World War. The body is an artificial intelligence system, and the relation of copy and original is reversed and then exploded.

G.O.D. is the Generator of Diversity, the source of the awe-inspiring multiple specificities of the polymorphous system of recognition and misrecognition we call the immune system. By the second illustration (1974), G.O.D. is no longer in front of the immune orchestra, but is standing, arms folded, looking authoritative but not very busy, at the top of the lymph node, surrounded by the musical lymphocytes (Plate 4). A special cell, the T suppressor cell, has taken over the role of conductor. By 1977, the illustration (Plate 5) no longer has a single conductor, but is 'led' by three mysterious subsets of T cells, who hold a total of twelve batons signifying their direction-giving surface identity markers; and G.O.D. scratches his head in patent confusion. But the immune band plays on. In the final illustration, from 1982, (Plate 6) 'the generator of diversity seems resigned to the conflicting calls of the angels of help and suppression', who perch above his left and right shoulders (Golub, 1987, p. 536). Besides G.O.D. and the two angels, there is a T cell conductor and two conflicting prompters, 'each urging its own interpretation'. The joke of single masterly control of organismic harmony in the symphonic system responsible for the integrity of 'self' has become a kind of postmodern pastiche of multiple centres and peripheries, where the immune music that the page suggests would surely sound like nursery school space music. All the actors that used to be on the stage-set for the unambiguous and coherent biopolitical subject are still present, but their harmonies are definitely a bit problematic.

By the 1980s, the immune system is unambiguously a postmodern object — symbolically, technically, and politically. Katherine Hayles (1987b) characterizes postmodernism in terms of 'three waves of developments occurring at multiple sites within the culture, including literature and science'. Her archaeology begins with Saussurean linguistics, through which symbol systems were 'denaturalized'. Internally generated relational difference, rather than mimesis, ruled signification. Hayles sees the culmination of this approach in Claude Shannon's mid-century statistical theory of information, developed for packing the largest number of signals on a transmission line for the Bell Telephone Company and extended to cover communication acts in general, including those directed by the codes of bodily semiosis in ethology or molecular biology. 'Information' generating and processing systems, therefore, are postmodern objects, embedded in a theory of internally differentiated signifiers and remote from doctrines of representation as mimesis. A history-changing artefact, 'information' exists only in very specific kinds of universes. Progressively, the world and the sign seemed to exist in incommensurable universes — there was literally no measure linking them, and the reading conventions for all texts came to resemble those required for science fiction. What emerged was a global technology that 'made the separation of text from context an everyday experience'. Hayles's second wave, 'energized by the rapid development of information technology, made the disappearance of stable, reproducible context an international phenomenon ... Context was no longer a natural part of every experience, but an artifact that could be altered at will.' Hayles's third wave of denaturalization concerned time. 'Beginning with the Special Theory of Relativity, time increasingly came to be seen not as an inevitable progression along a linear scale to which all humans were subject, but as a construct that could be conceived in different ways.'

Language is no longer an echo of the verbum dei, but a technical construct working on principles of internally generated difference. If the early modern natural philosopher or Renaissance physician conducted an exegesis of the text of nature written in the language of geometry or of cosmic correspondences, the postmodern scientist still reads for a living, but has as a text the coded systems of recognition — prone to the pathologies of mis-recognition — embodied in objects like computer networks and immune systems. The
extraordinarily close tie of language and technology could hardly be overstressed in postmodernism. The ‘construct’ is at the centre of attention; making, reading, writing, and meaning seem to be very close to the same thing. This near-identity between technology, body, and semiosis suggests a particular edge to the mutually constitutive relations of political economy, symbol, and science that ‘inform’ contemporary research trends in medical anthropology.

THE APPARATUS OF BODILY PRODUCTION: THE TECHNO-BIOPOLITICS OF ENGAGEMENT

Bodies, then, are not born; they are made (Plate 7). Bodies have been as thoroughly denaturalized as sign, context, and time. Late twentieth-century bodies do not grow from internal harmonic principles theorized within Romanticism. Neither are they discovered in the domains of realism and modernism. One is not born a woman, Simone de Beauvoir correctly insisted. It took the political-epistemological terrain of postmodernism to be able to insist on a co-text to de Beauvoir’s: one is not born an organism. Organisms are made; they are constructs of a world-changing kind. The constructions of an organism’s boundaries, the job of the discourses of immunology, are particularly potent mediators of the experiences of sickness and death for industrial and post-industrial people.

In this over-determined context, I will ironically – and inescapably – invoke a constructionist concept as an analytic device to pursue an understanding of what kinds of units, selves, and individuals inhabit the universe structured by immune system discourse: This conceptual tool, ‘the apparatus of bodily production’, was discussed earlier on pp. 197–201 (King, 1987b). Scientific bodies are not ideological constructions. Always radically historically specific, bodies have a different kind of specificity and effectivity, and so they invite a different kind of engagement and intervention. The notion of a ‘material-semiotic actor’ is intended to highlight the object of knowledge as an active part of the apparatus of bodily production, without ever implying immediate presence of such objects or, what is the same thing, their final or unique determination of what can count as objective knowledge of a biomedical body at a particular historical juncture. Bodies as objects of knowledge are material-semiotic generative nodes. Their boundaries materialize in social interaction; ‘objects’ like bodies do not pre-exist as such. Scientific objectivity (the siting/sighting of objects) is not about dis-engaged discovery, but about mutual and usually unequal structuring, about taking risks. The various contending biological bodies emerge at the intersection of biological research, writing, and publishing; medical and other business practices; cultural productions of all kinds, including available metaphors and narratives; and technology, such as the visualization tech-

ologies that bring colour-enhanced killer T cells and intimate photographs of the developing foetus into high-gloss art books for every middle-class home (Nilsson, 1977, 1987).

But also invited into that node of intersection is the analogue to the lively languages that actively intertwine in the production of literary value: the coyote and protos embodied of a world as witty agent and actor. Perhaps our hopes for accountability in the techno-biopolitics in postmodern frames turn on revisioning the world as coding trickster with whom we must learn to converse. Like a protein subjected to stress, the world for us may be thoroughly denatured, but it is not any less consequential. So while the late twentieth-century immune system is a construct of an elaborate apparatus of bodily production, neither the immune system nor any other of biomedicine’s world-changing bodies – like a virus – is a ghostly fantasy. Coyote is not a ghost, merely a protos trickster.

The following chart abstracts and dichotomizes two historical moments in the biomedical production of bodies from the late nineteenth century to the 1980s. The chart highlights epistemological, cultural, and political aspects of possible contestations for constructions of scientific bodies in this century. The chart itself is a traditional little machine for making particular meanings. Not a description, it must be read as an argument, and one which relies on a suspect technology for the production of meanings – binary dichotomization.

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<thead>
<tr>
<th>Representation</th>
<th>Simulation</th>
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<td>Bourgeois novel</td>
<td>Science fiction</td>
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<tr>
<td>Realism and modernism</td>
<td>Postmodernism</td>
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<td>Organism</td>
<td>Biotic component, code</td>
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<td>Work</td>
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<td>Mimesis</td>
<td>Play of signifiers</td>
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<td>Depth, integrity</td>
<td>Surface, boundary</td>
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<td>Heat</td>
<td>Noise</td>
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<td>Physiology</td>
<td>Communications engineering</td>
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<td>Microbiology, tuberculosis</td>
<td>Immunology, AIDS</td>
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<td>Magic bullet</td>
<td>Immunomodulation</td>
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<tr>
<td>Small group</td>
<td>Subsystem</td>
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<td>Perfection</td>
<td>Optimization</td>
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<td>Eugenics</td>
<td>Genetic engineering</td>
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<td>Decadence</td>
<td>Obsolescence</td>
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<td>Hygiene</td>
<td>Stress management</td>
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<td>Organic division of labour</td>
<td>Ergonomics, cybernetics</td>
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<td>Functional specialization</td>
<td>Modular construction</td>
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<td>Biological determinism</td>
<td>System constraints</td>
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</table>
Reproduction
Individual
Community ecology
Racial chain of being
Colonialism
Nature/culture
Co-operation
Freud
Sex
Labour
Mind
Second World War
White capitalist patriarchy

| Replication | Replicon | Ecosystem | United Nations humanism | Transnational capitalism | Fields of difference | Communications enhancement | Lacan | Surrogacy | Robotics | Artificial intelligence | Star Wars | Informatics of domination |

It is impossible to see the entries in the right-hand column as 'natural', a realization that subverts naturalistic status for the left-hand column as well. From the eighteenth to the mid-twentieth centuries, the great historical constructions of gender, race, and class were embedded in the organically marked bodies of woman, the colonized or enslaved, and the worker. Those inhabiting these marked bodies have been symbolically other to the fictive rational self of universal, and so unmarked, species man, a coherent subject. The marked organic body has been a critical locus of cultural and political contestation, crucial both to the language of the liberal politics of identity and to systems of domination drawing on widely shared languages of nature as resource for the appropriations of culture. For example, the sexualized bodies of nineteenth-century middle-class medical advice literature in England and the United States, in their female form organized around the maternal function and the physical site of the uterus and in their male form ordered by the spermatic economy tied closely to the nervous system, were part of an elaborate discourse of organic economy. The narrative field in which these bodies moved generated accounts of rational citizenship, bourgeois family life, and prophylaxis against sexual pollution and inefficiency, such as prostitution, criminality, or race suicide. Some feminist politics argued for the full inclusion of women in the body politic on grounds of maternal functions in the domestic economy extended to a public world. Late into the twentieth century, gay and lesbian politics have ironically and critically embraced the marked bodies constructed in nineteenth- and twentieth-century sexologies and gender identity medicines to create a complex humanist discourse of sexual liberation. Negritude, feminine writing, various separatisms, and other recent cultural movements have both drawn on and subverted the logics of naturalization central to biomedical discourse on race and gender in the histories of colonization and male supremacy. In all of these various, oppositionally interlinked, political and biomedical accounts, the body remained a relatively unambiguous locus of identity, agency, labour, and hierarchalized function. Both scientific humanisms and biological determinisms could be authorized and contested in terms of the biological organism crafted in post-eighteenth-century life sciences.

But how do narratives of the normal and the pathological work when the biological and medical body is symbolized and operated upon, not as a system of work, organized by the hierarchical division of labour, ordered by a privileged dialectic between highly localized nervous and reproductive functions, but instead as a coded text, organized as an engineered communications system, ordered by a fluid and dispersed command-control-intelligence network? From the mid-twentieth century, biomedical discourses have been progressively organized around a very different set of technologies and practices, which have destabilized the symbolic privilege of the hierarchical, localized, organic body. Concurrently – and out of some of the same historical matrices of decolonization, multinational capitalism, world-wide high-tech militarization, and the emergence of new collective political actors in local and global politics from among those persons previously consigned to labour in silence – the question of 'differences' has destabilized humanist discourses of liberation based on a politics of identity and substantive unity. Feminist theory as a self-conscious discursive practice has been generated in this post-Second World War period characterized by the translation of Western scientific and political languages of nature from those based on work, localization, and the marked body to those based on codes, dispersal and networking, and the fragmented postmodern subject. An account of the biomedical, biotechnical body must start from the multiple molecular interfacing of genetic, nervous, endocrine, and immune systems. Biology is about recognition and misrecognition, coding errors, the body's reading practices (for example, frameshift mutations), and billion-dollar projects to sequence the human genome to be published and stored in a national genetic 'library'. The body is conceived as a strategic system, highly militarized in key arenas of imagery and practice. Sex, sexuality, and reproduction are theorized in terms of local investment strategies; the body cases to be a stable spatial map of normalized functions and instead emerges as a highly mobile field of strategic differences. The biomedical-biotechnical body is a semiotic system, a complex meaning-producing field, for which the discourse of immunology, that is, the central biomedical discourse on recognition/misrecognition, has become a high-stakes practice in many senses.

In relation to objects like biotic components and codes, one must think, not in terms of laws of growth and essential properties, but rather in terms of
strategies of design, boundary constraints, rates of flows, system logics, and costs of lowering constraints. Sexual reproduction becomes one possible strategy among many, with costs and benefits theorized as a function of the system environment. Disease is a subspecies of information malfunction or communications pathology; disease is a process of misrecognition or transgression of the boundaries of a strategic assemble called self. Ideologies of sexual reproduction can no longer easily call upon the notions of unproblematic sex and sex role as organic aspects in 'healthy' natural objects like organisms and families. Likewise for race, ideologies of human diversity have to be developed in terms of frequencies of parameters and fields of power-charged differences, not essences and natural origins or homes. Race and sex, like individuals, are artefacts sustained or undermined by the discursive nexus of knowledge and power. Any objects or persons can be reasonably thought of in terms of disassembly and reassembly; no 'natural' architectures constrain system design. Design is none the less highly constrained. What counts as a 'unit', a one, is highly problematic, not a permanent given. Individuality is a strategic defence problem.

One should expect control strategies to concentrate on boundary conditions and interfaces, on rates of flow across boundaries, not on the integrity of natural objects. 'Integrity' or 'sincerity' of the Western self gives way to decision procedures, expert systems, and resource investment strategies. 'Degrees of freedom' becomes a very powerful metaphor for politics. Human beings, like any other component or subsystem, must be localized in a system architecture whose basic modes of operation are probabilistic. No objects, spaces, or bodies are sacred in themselves; any component can be interfaced with any other if the proper standard, the proper code, can be constructed for processing signals in a common language. In particular, there is no ground for ontologically opposing the organic, the technical, and the textual.4 But neither is there any ground for opposing the mythical to the organic, textual, and technical. Their convergences are more important than their residual oppositions. The privileged pathology affecting all kinds of components in this universe is stress — communications breakdown. In the body stress is theorized to operate by 'depressing' the immune system. Bodies have become cyborgs — cybernetic organisms — compounds of hybrid techno-organic embodiment and textuality (Haraway, 1985 [this vol. pp. 149–81]). The cyborg is text, machine, body, and metaphor — all theorized and engaged in practice in terms of communications.

**CYBORGS FOR EARTHLY SURVIVAL**

However, just as the nineteenth- and twentieth-century organism accommodated a diverse field of cultural, political, financial, theoretic and technical contestation, so also the cyborg is a contested and heterogeneous construct. It is capable of sustaining oppositional and liberatory projects at the levels of research practice, cultural productions, and political intervention. This large theme may be introduced by examining contrasting constructions of the late twentieth-century biotechnical body, or of other contemporary postmodern communications systems. These constructs may be conceived and built in at least two opposed modes: (1) in terms of master control principles, articulated within a rationalist paradigm of language and embodiment; or (2) in terms of complex, structurally embedded semiotics with many 'generators of diversity' within a counter-rationalist (not irrationalist) or hermeneutic/situationist/constructivist discourse readily available within Western science and philosophy. Terry Winograd and Fernando Flores' (1986) joint work on *Understanding Computers and Cognition* is particularly suggestive for thinking about the potentials for cultural/scientific/political contestation over the technologies of representation and embodiment of 'difference' within immunological discourse, whose object of knowledge is a kind of 'artificial intelligence/language/communication system of the biological body'.6

Winograd and Flores conduct a detailed critique of the rationalist paradigm for understanding embodied (or 'structure-determined') perceptual and language systems and for designing computers that can function as prostheses in human projects. In the simple form of the rationalist model of cognition,

One takes for granted the existence of an objective reality made up of things bearing properties and entering into relations. A cognitive being gathers 'information' about those things and builds up a mental 'model' which will be in some respects correct (a faithful representation of reality) and in other respects incorrect. Knowledge is a storehouse of representations that can be called upon to do reasoning and that can be translated into language. Thinking is a process of manipulating those representations. (Winograd, in Edwards and Gordon, forthcoming)

It is this doctrine of representation that Winograd finds wrong in many senses, including on the plane of political and moral discourse usually suppressed in scientific writing. The doctrine, he continues, is also technically wrong for further guiding research in software design: 'Contrary to common consensus, the "commonsense" understanding of language, thought, and rationality inherent in this tradition ultimately hinders the fruitful application of computer technology to human life and work'. Drawing on Heidegger, Gadamer, Maturana, and others, Winograd and Flores develop a doctrine of interdependence of interpreter and interpreted, which are not discrete and independent entities. Situated pre-understandings are critical to all communication and action. 'Structure-determined systems' with histories shaped through processes of 'structural-
coupling' give a better approach to perception than doctrines of representation.

Changes in the environment have the potential of changing the relative patterns of activity within the nervous system itself that in turn orient the organism's behavior, a perspective that invalidates the assumption that we acquire representations of our environment. Interpretation, that is, arises as a necessary consequence of the structure of biological beings. (Winograd, in Edwards and Gordon, forthcoming)

Winograd conceives the coupling of the inner and outer worlds of organisms and ecosystems, of organisms with each other, or of organic and technical structures in terms of metaphors of language, communication, and construction— but not in terms of a rationalist doctrine of mind and language or a disembodied instrumentalism. Linguistic acts involve shared acts of interpretation, and they are fundamentally tied to engaged location in a structured world. Context is a fundamental matter, not as surrounding 'information', but as co-structure or co-text. Cognition, engagement, and situation-dependence are linked concepts for Winograd, technically and philosophically. Language is not about description, but about commitment. The point applies to 'natural' language and to 'built' language.

How would such a way of theorizing the technics and biology of communication affect immune system discourse about the body's 'technology' for recognizing self and other and for mediating between 'mind' and 'body' in postmodern culture? Just as computer design is a map of and for ways of living, the immune system is in some sense a diagram of relationships and a guide for action in the face of questions about the boundaries of the self and about mortality. Immune system discourse is about constraint and possibility for engaging in a world of full of 'difference', replete with non-self. Winograd and Flores' approach contains a way to contest for notions of pathology, or 'breakdown', without militarizing the terrain of the body.

Breakdowns play a central role in human understanding. A breakdown is not a negative situation to be avoided, but a situation of non-obviousness, in which some aspect of the network of tools that we are engaged in using is brought forth to visibility... A breakdown reveals the nexus of relations necessary for us to accomplish our task... This creates a clear objective for design — to anticipate the form of breakdowns and provide a space of possibilities for action when they occur. (Winograd, in Edwards and Gordon, forthcoming)

This is not a Star Wars or Strategic Computing Initiative relation to vulnerability, but neither does it deny therapeutic action. It insists on locating therapeutic, reconstructive action (and so theoretic understanding) in terms of situated purposes, not fantasies of the utterly defended self in a body as automated militarized factory, a kind of ultimate self as Robotic Battle Manager meeting the enemy (not-self) as it invades in the form of bits of foreign information threatening to take over the master control codes.

Situated purposes are necessarily finite, rooted in partiality and a subde play of same and different, maintenance and dissolution. Winograd and Flores' linguistic systems are 'denaturalized', fully constructivist entities; and in that sense they are postmodern cyborgs that do not rely on impermeable boundaries between the organic, technical, and textual. But their linguistic/communication systems are distinctly oppositional to the AI cyborgs of an 'information society', with its exterminist pathologies of final abstraction from vulnerability, and so from embodiment.7

THE ONE AND THE MANY:

SELVES, INDIVIDUALS, UNITS, AND SUBJECTS

What is constituted as an individual within postmodern biotechnical, biomedical discourse? There is no easy answer to this question, for even the most reliable Western individuated bodies, the mice and men of a well-equipped laboratory, neither stop nor start at the skin, which is itself something of a teeming jungle threatening illicit fusions, especially from the perspective of a scanning electron microscope. The multi-billion-dollar project to sequence 'the human genome' in a definitive genetic library might be seen as one practical answer to the construction of 'man' as 'subject' of science. The genome project is a kind of technology of postmodern humanism, defining 'the' genome by reading and writing it. The technology required for this particular kind of literacy is suggested by the advertisement for MacroGene Workstation. The ad ties the mythical, organic, technical, and textual together in its graphic invocation of the 'missing link' crawling from the water on to the land, while the text reads, 'In the LKB MacroGene Workstation [for sequencing nucleic acids], there are no "missing links".' (See Plate 8.) The monster Ichthyostega crawling out of the deep in one of earth's great transitions is a perfect figure for late twentieth-century bodily and technical metamorphoses. An act of canonization to make the theorists of the humanities pause, the standard reference work called the human genome would be the means through which human diversity and its pathologies could be tamed in the exhaustive code kept by a national or international genetic bureau of standards. Costs of storage of the giant dictionary will probably exceed costs of its production, but this is a mundane matter to any librarian (Roberts, 1987a,b,c; Kanigel, 1987). Access to this standard for 'man' will be a matter of international financial, patent, and similar struggles. The Peoples of the Book will
finally have a standard genesis story. In the beginning was the copy.

The Human Genome Project might define postmodern species being (pace the philosophers), but what of individual being? Richard Dawkins raised this knotty problem in The Extended Phenotype. He noted that in 1912, Julian Huxley defined individuality in biological terms as 'literally indivisibility – the quality of being sufficiently heterogeneous in form to be rendered non-functional if cut in half' (Dawkins, 1982, p. 250). That seems a promising start. In Huxley’s terms, surely you or I would count as an individual, while many worms would not. The individuality of worms was not achieved even at the height of bourgeois liberalism, so no cause to worry there. But Huxley’s definition does not answer which function is at issue. Nothing answers that in the abstract: it depends on what is to be done. You or I (whatever problematic address these pronouns have) might be an individual for some purposes, but not for others. This is a normal ontological state for cyborgs and women, if not for Aristotelians and men. Function is about action. Here is where Dawkins has a radical solution, as he proposes a view of individuality that is strategic at every level of meaning. There are many kinds of individuals for Dawkins, but one kind has primacy. ‘The whole purpose of our search for a “unit of selection” is to discover a suitable actor to play the leading role in our metaphors of purpose’ (1982, p. 91). The ‘metaphors of purpose’ come down to a single bottom line: replication. ‘A successful replicator is one that succeeds in lasting, in the form of copies, for a very long time measured in generations, and succeeds in propagating many copies of itself’ (1982, pp. 87–8).

The replicator fragment whose individuality finally matters most, in the constructed time of evolutionary theory, is not particularly ‘unitary’. For all that it serves, for Dawkins, as the ‘unit’ of natural selection, the replicator’s boundaries are not fixed and its inner reaches remain mutable. But still, these units must be a bit smaller than a ‘single’ gene coding for a protein. Units are only good enough to sustain the technology of copying. Like the replicons’ borders, the boundaries of other strategic assemblages are not fixed either – it all has to do with the broad net cast by strategies of replication in a world where self and other are very much at stake.

The integrated multi-cellular organism is a phenomenon which has emerged as a result of natural selection on primitively selfish replicators. It has paid replicators to behave gregariously [so much for ‘harmony’, in the short run]. The phenotypic power by which they ensure their survival is in principle extended and unbounded. In practice the organism has arisen as a partially bounded local concentration, a shared knot of replicator power. (Dawkins, 1982, p. 264)

‘In principle extended and unbounded’ – this is a remarkable statement of interconnectedness, but of a very particular kind, one that leads to theorizing the living world as one vast arms race. [P]henotypes that extend outside the body do not have to be inanimate artefacts: they themselves can be built of living tissue . . . I shall show that it is logically sensible to regard parasite genes as having phenotypic expression in host bodies and behaviour’ (1982, p. 210, emphasis mine). But the being who serves as another’s phenotype is itself populated by propagules with their own replicative ends. ‘[A]n animal will not necessarily submit passively to being manipulated, and an evolutionary “arms race” is expected to develop’ (1982, p. 39). This is an arms race that must take account of the stage of the development of the means of bodily production and the costs of maintaining it:

The many-celled body is a machine for the production of single-celled propagules. Large bodies, like elephants, are best seen as heavy plant and machinery, a temporary resource drain, invested so as to improve later propagate production. In a sense the germ-line would ‘like’ to reduce capital investment in heavy machinery . . . (1982, p. 254)

Large capital is indeed a drain; small is beautiful. But you and I have required large capital investments, in more than genetic terms. Perhaps we should keep an eye on the germ-line, especially since ‘we’ – the non-germ-line components of adult mammals (unless you identify with your haploid gametes and their contents, and some do) – cannot be copy units. ‘We’ can only aim for a defended self, not copy fidelity, the property of other sorts of units. Within ‘us’ is the most threatening other – the propagules, whose phenotype we, temporarily, are.

What does all this have to do with the discourse of immunology as a map of systems of ‘difference’ in late capitalism? Let me attempt to convey the flavour of representations of the curious bodily object called the human immune system, culled from textbooks and research reports published in the 1980s. The IS is composed of about 10 to the 12th cells, two orders of magnitude more cells than the nervous system has. These cells are regenerated throughout life from pluripotent stem cells that themselves remain undifferentiated. From embryonic life through adulthood, the immune system is sited in several relatively amorphous tissues and organs, including the thymus, bone marrow, spleen, and lymph nodes; but a large fraction of its cells are in the blood and lymph circulatory systems and in body fluids and spaces. There are two major cell lineages to the system. The first is the lymphocytes, which include the several types of T cells (helper, suppressor, killer, and variations of all these) and the B cells (each type of which can produce only one sort of the vast array of potential circulating antibodies). T and B cells have particular specificities capable of recognizing almost any molecular array of the right size that can ever exist, no matter how
clever industrial chemistry gets. This specificity is enabled by a baroque somatic mutation mechanism, clonal selection, and a polygenic receptor or marker system. The second immune cell lineage is the mononuclear phagocyte system, including the multi-talented macrophages, which, in addition to their other recognition skills and connections, also appear to share receptors and some hormonal peptide products with neural cells. Besides the cellular compartment, the immune system comprises a vast array of circulating acellular products, such as antibodies, lymphokines, and complement components. These molecules mediate communication among components of the immune system, but also between the immune system and the nervous and endocrine systems, thus linking the body's multiple control and co-ordination sites and functions. The genetics of the immune system cells, with their high rates of somatic mutation and gene product splicings and rearrangings to make finished surface receptors and antibodies, makes a mockery of the notion of a constant genome even within 'one' body. The hierarchical body of old has given way to a network-body of truly amazing complexity and specificity. The immune system is everywhere and nowhere. Its specificities are indefinite if not infinite, and they arise randomly, yet these extraordinary variations are the critical means of maintaining individual bodily coherence.

In the early 1970s, the Nobel Prize-winning immunologist, Niels Jerne, proposed a theory of immune system self-regulation, called the network theory, that must complete this minimalist account (Jerne, 1985; Golub, 1987, pp. 379–92). The theory differs from other immunological thinking because it endows the immune system with the ability to regulate itself using only itself (Golub, 1987, p. 379). Jerne's basic idea was that any antibody molecule must be able to act functionally as both antibody to some antigen and as antigen for the production of an antibody to itself, albeit at another region of 'itself'. All these sites have acquired a nomenclature sufficiently daunting to keep popular understanding of the theory at bay indefinitely, but the basic conception is simple. The concatenation of internal recognitions and responses would go on indefinitely, in a series of interior mirrorings of sites on immunoglobulin molecules, such that the immune system would always be in a state of dynamic internal responding. It would never be passive, 'at rest', awaiting an activating stimulus from a hostile outside. In a sense, there could be no exterior antigenic structure, no 'invader', that the immune system had not already 'seen' and mirrored internally. 'Self' and 'other' lose their rationalist oppositional quality and become subtle plays of partially mirrored readings and responses. The notion of the internal image is the key to the theory, and it entails the premise that every member of the immune system is capable of interacting with every other member. As with Dawkins's extended phenotype, a radical conception of connection emerges unexpectedly at the heart of postmodern moves.

This is a unique idea, which if correct means that all possible reactions that the immune system can carry out with epitopes in the world outside of the animal are already accounted for in the internal system of paratopes and idiotopes already present inside the animal (Golub, 1987, pp. 382–3)

Jerne's conception recalls Winograd and Flores' insistence on structural coupling and structure-determined systems in their approach to perception. The internal, structured activity of the system is the crucial issue, not formal representations of the 'outer' world within the 'inner' world of the communications system that is the organism. Both Jerne's and Winograd's formulations resist the means of conceptualization facilitated most readily by a rationalist theory of recognition or representation. In discussing what he called the deep structure and generative grammar of the immune system, Jerne argued that 'an identical structure can appear on many structures in many contexts and be reacted to by the reader or by the immune system' (quoted in Golub, 1987, p. 384).

Does the immune system—the fluid, dispersed, networking techno-organic-textual-mythic system that ties together the more stodgy and localized centres of the body through its acts of recognition—represent the ultimate sign of altruistic evolution towards wholeness, in the form of the means of co-ordination of a coherent biological self? In a word, no, at least not in Leo Buss's (1987) persuasive postmodern theoretic scheme of The Evolution of Individuality.

Constituting a kind of technological holism, the earliest cybernetic communications systems theoretic approaches to the biological body from the late 1940s through the 1960s privileged co-ordination, effected by 'circular causal feedback mechanisms'. In the 1950s, biological bodies became technological communications systems, but they were not quite fully reconstituted as sites of 'difference' in its postmodern sense—the play of signifiers and replicators in a strategic field whose significance depended problematically, at best, on a world outside itself. Even the first synthetic proclamations of sociobiology, particularly E.O. Wilson's Sociobiology: The New Synthesis (1975), maintained a fundamentally techno-organistic or holist ontology of the cybernetic organism, or cyborg, repositioned in evolutionary theory by post-Second World War extensions and revisions of the principle of natural selection. This 'conservative' dimension of Wilson and of several other sociobiologists has been roundly criticized by evolutionary theorists who have gone much further in denaturing the co-ordinating principles of organismic biology at every level of biotic organization, from gene fragments through ecosystems. The sociobiological theory of inclusive fitness maintained a kind of envelope around the organism and its kin, but that envelope
has been opened repeatedly in late 1970s' and 1980s' evolutionary theory.

Dawkins (1976, 1982) has been among the most radical disruptors of cyborg biological holism, and in that sense he is most deeply informed by a postmodern consciousness, in which the logic of the permeability among the textual, the technic, and the biotic and of the deep theorization of all possible texts and bodies as strategic assemblages has made the notions of 'organism' or 'individual' extremely problematic. He ignores the mythic, but it pervades his texts. 'Organism' and 'individual' have not disappeared; rather, they have been fully denaturalized. That is, they are ontologically contingent constructs from the point of view of the biologist, not just in the loose raving of a cultural critic or feminist historian of science.

Leo Buss reinterpreted two important remaining processes or objects that had continued to resist such denaturing: (1) embryonic development, the very process of the construction of an individual; and (2) immune system interactions, the iconic means for maintaining the integrity of the one in the face of the many. His basic argument for the immune system is that it is made up of several variant cell lineages, each engaged in its own replicative 'ends'. The contending cell lineages serve somatic function because

the receptors that ensure delivery of growth-enhancing mitogens also compel somatic function. The cytotoxic T-cell recognizes its target with the same receptor arrangement used by the macrophage to activate that cell lineage. It is compelled to attack the infected cell by the same receptor required for it to obtain mitogens from helper cells . . . The immune system works by exploiting the inherent propensity of cells to further their own rate of replication. (Buss, 1987, p. 87)

The individual is a constrained accident, not the highest fruit of earth history's labours. In metazoan organisms, at least two units of selection, cellular and individual, pertain; and their 'harmony' is highly contingent. The parts are not for the whole. There is no part/whole relation at all, in any sense Aristotle would recognize. Pathology results from a conflict of interests between the cellular and organismic units of selection. Buss has thereby recast the multi-cellular organism's means of self-recognition, of the maintenance of 'wholes', from an illustration of the priority of co-ordination in biology's and medicine's ontology to a chief witness for the irreducible vulnerability, multiplicity, and contingency of every construct of individuality.

The potential meanings of such a move for conceptualizations of pathology and therapeutics within Western biomedicine are, to say the least, intriguing. Is there a way to turn the discourse suggested by Jerne, Dawkins, and Buss into an oppositional/alternative/liberatory approach analogous to that of Winograd and Flores in cognition and computer research? Is this postmodern body, this construct of always vulnerable and contingent individuality, necessarily an automated Star Wars battlefield in the now extra-terrestrial space of the late twentieth-century Western scientific body's intimate interior? What might we learn about this question by attending to the many contemporary representations of the immune system, in visualization practices, self-help doctrines, biologists' metaphors, discussions of immune system diseases, and science fiction? This is a large enquiry, and in the paragraphs that follow I only begin to sketch a few of the sometimes promising but more often profoundly disturbing recent cultural productions of the postmodern immune system-mediated body. At this stage, the analysis can only serve to sharpen, not to answer, the question.

IMMUNE POWER: IMAGES, FICTIONS, AND FIXATIONS

This chapter opened with a reminder that science has been a travel discourse, intimately implicated in the other great colonizing and liberatory readings and writings so basic to modern constitutions and dissolutions of the marked bodies of race, sex, and class. The colonizing and the liberatory, and the constituting and the dissolving, are related as internal images. So I continue this tour through the science museum of immunology's cultures with the 'land, ho!' effect described by my colleague, James Clifford, as we waited in our university chancellor's office for a meeting in 1986. The chancellor's office walls featured beautiful colour-enhanced photographic portraits of the outer planets of earth's solar system. Each 'photograph' created the effect for the viewer of having been there. It seemed some other observer must have been there, with a perceptual system like ours and a good camera; somehow it must have been possible to see the land masses of Jupiter and Saturn coming into view of the great ships of Voyager as they crossed the empty reaches of space. Twentieth-century people are used to the idea that all photographs are constructs in some sense, and that the appearance that a photograph gives of being a 'message without a code', that is, what is pictured being simply there, is an effect of many layers of history, including prominently, technology (Barthes, 1982; Haraway, 1984-5; Petchesky, 1987). But the photographs of the outer planets up the ante on this issue by orders of magnitude. The wonderful pictures have gone through processes of construction that make the metaphor of the 'eye of the camera' completely misleading. The chancellor's snapshot of Jupiter is a postmodern photographic portrait - a denatured construct of the first order, which has the effect of utter naturalistic realism. Someone was there. Land, ho! But that someone was a spaceship that sent back digitalized signals to a whole world of transformers and imagers on a distant place called 'earth', where art photographs could be produced to give a reassuring sense of the there ness of Jupiter, and, not incidentally, of spacemen, or at least virtual spacemen, whose eyes would see in the same colour spectrum as an earthly primate's.
The same analysis must accompany any viewing of the wonderful photographs and other imaging precipitates of the components of the immune system. The cover of *Immunology: A Synthesis* (Golub, 1987) features an iconic replication of its title's allusion to synthesis: a multi-coloured computer graphic of the three-dimensional structure of insulin showing its antigenic determinants clustered in particular regions. Golub elicits consciousness of the *constructed* quality of such images in his credit: 'Image created by John A. Tainer and Elizabeth D. Getzoff'. Indeed, the conventional trope of scientist as artist runs throughout Golub's text, such that scientific construction takes on the particular resonances of high art and genius, more than of critical theories of productions of the postmodern body. But the publications of Lennart Nilsson’s photographs, in the coffee table art book *The Body Victorious* (Nilsson, 1987) and in the *National Geographic* (Jaret, 1986), allow the ‘land, hol’ effect unmediated scope (Plates 9 and 10). The blasted scenes, sumptuous textures, evocative colours, and ET monsters of the immune landscape are simply there, inside us. A white extruding tendril of a pseudopodinous macrophage ensnares a bacterium; the hillocks of chromosomes lie flattened on a blue-hued moonscape of some other planet; an infected cell buds myriads of deadly virus particles into the reaches of inner space where more cells will be victimized; the auto-immune-disease-ravaged head of a femur glows in a kind of sunset on a non-living world; cancer cells are surrounded by the lethal mobil squads of killer T cells that throw chemical poisons into the self’s malignant traitor cells.

The equation of Outer Space and Inner Space, and of their conjoint discourses of extra-terrestrialism, ultimate frontiers, and high technology war, is quite literal in the official history celebrating 100 years of the National Geographic Society (Bryan, 1987). The chapter that recounts the *National Geographic’s* coverage of the Mercury, Gemini, Apollo, and Mariner voyages is called ‘Space’ and introduced with the epigraph, ‘The Choice Is the Universe – or Nothing’. The final chapter, full of Nilsson’s and other biomedical images, is entitled ‘Inner Space’ and introduced with the epigraph, ‘The Stuff of the Stars Has Come Alive’ (Bryan, 1987, pp. 454, 532). It is photography that convinces the viewer of the fraternal relation of inner and outer space. But curiously, in outer space, we see spacemen fitted into explorer craft or floating about as individuated cosmic foetuses, while in the supposed earthy space of our own interiors, we see non-humanoid strangers who are supposed to be the means by which our bodies sustain our integrity and individuality, indeed our humanity in the face of a world of others. We seem invaded not just by the threatening ‘non-selves’ that the immune system guards against, but more fundamentally by our own strange parts. No wonder auto-immune disease carries such awful significance, marked from the first suspicion of its existence in 1901 by Morgenroth and Ehrlich’s term, *horror autotaxias*.

The trope of space invaders evokes a particular question about directionality of travel in which direction is there an invasion? From space to earth? From outside to inside? The reverse? Are boundaries defended symmetrically? Is inner/outer a hierarchalized opposition? Expansionist Western medical discourse in colonizing contexts has been obsessed with the notion of contagion and hostile penetration of the healthy body, as well as of terrorism and mutiny from within. This approach to disease involved a stunning reversal: the colonized was perceived as the invader. In the face of the disease genocides accompanying European ‘penetration’ of the globe, the ‘coloured’ body of the colonized was constructed as the dark source of infection, pollution, disorder, and so on, that threatened to overwhelm white manhood (cities, civilization, the family, the white personal body) with its decadent emanations. In establishing the game parks of Africa, European law turned indigenous human inhabitants of the ‘nature reserves’ into poachers, invaders in their own terrain, or into part of the wildlife. The residue of the history of colonial tropical medicine and natural history in late twenty-century immune discourse should not be underestimated. Discourses on parasitic diseases and AIDS provide a surfet of examples.

The tones of colonial discourse are also audible in the opening paragraphs of *Immunology: The Science of Non-Self Discrimination*, where the dangers to individuality are almost lasciviously recounted. The first danger is ‘fusion of individuals’:

In a jungle or at the bottom of the sea, organisms – especially plants, but also all kinds of sessile animals – are often in such close proximity that they are in constant danger of losing their individuality by fusion ... But only in the imagination of an artist does all-out fusion occur; in reality, organisms keep pretty much separate, no matter how near to one another they live and grow. (Klein, 1982, p. 3)

In those exotic, allotrophic places, any manner of contact might occur to threaten proper mammalian self-definition. Harmony of the organism, that favourite theme of biologists, is explained in terms of the aggressive defence of individuality; and Klein advocates devoting as much time in the undergraduate biology curriculum to defence as to genetics and evolution. It reads a bit like the defence department fighting the social services budget for federal funds. Immunology for Klein is ‘intraorganismic defense reaction’, proceeding by ‘recognition, processing, and response’. Klein defines ‘self’ as ‘everything constituting an integral part of a given individual’ (1982, p. 5; emphasis in original). What counts as an individual, then, is the lub of the matter. Everything else is ‘not-self’ and elicits a defence reaction if
boundaries are crossed. But this chapter has repeatedly tried to make problematic just what does count as self, within the discourses of biology and medicine, much less in the postmodern world at large.

A diagram of the ‘Evolution of Recognition Systems’ in a recent immunology textbook makes clear the intersection of the themes of literally ‘wonderful’ diversity, escalating complexity, the self as a defended stronghold, and extra-terrestrialism (Plate 11). Under a diagram culminating in the evolution of the mammals, represented without comment by a mouse and a fully-suited spaceman,11 who appears to be stepping out, perhaps on the surface of the moon, is this explanation:

From the humble amoeba searching for food (top left) to the mammal with its sophisticated humoral and cellular immune mechanisms (bottom right), the process of ‘self versus non-self recognition’ shows a steady development, keeping pace with the increasing need of animals to maintain their integrity in a hostile environment. The decision at which point ‘immunity’ appeared is thus a purely semantic one. (Playfair, 1984, p. 3; emphasis in original)

These are the semantics of defence and invasion. When is a self enough of a self that its boundaries become central to entire institutionalized discourses in medicine, war, and business? Immunity and invulnerability are intersecting concepts, a matter of consequence in a nuclear culture unable to accommodate the experience of death and finitude within available liberal discourse on the collective and personal individual. Life is a window of vulnerability. It seems a mistake to close it. The perfection of the fully defended, ‘victorious’ self is a chilling fantasy, linking phagocytic amoeba and moon-voyaging man cannibalizing the earth in an evolutionary teleology of post-apocalypse extra-terrestrialism. It is a chilling fantasy, whether located in the abstract spaces of national discourse, or in the equally abstract spaces of our interior bodies.

Images of the immune system as battlefield abound in science sections of daily newspapers and in popular magazines, for example, Time magazine’s 1984 graphic for the AIDS virus’s ‘invasion’ of the cell-as-factory. The virus is imaged as a tank, and the viruses ready for export from the expropriated cells are lined up as tanks ready to continue their advance on the body as a productive force. The National Geographic explicitly pund on Star Wars in its graphic entitled ‘Cell Wars’ in Jaret’s ‘The Wars Within’ (1986, pp. 708–9). The battle imagery is conventional, not unique to a nuclear and Cold War era, but it has taken on all the specific markings of those particular historical crises. The militarized, automated factory is a favourite convention among immune system illustrators and photographic processors. The specific historical markings of a Star Wars–maintained individuality12 are enabled in large measure by high-technology visualization technologies, which are also critical to the material means of conducting postmodern war, science, and business, such as computer-aided graphics, artificial intelligence software, and many kinds of scanning systems.

‘Imaging’ or ‘visualization’ has also become part of therapeutic practice in both self-help and clinical settings, and here the contradictory possibilities and potent ambiguities over biomedical technology, body, self, and other emerge poignantly. The immune system has become a lucrative terrain of self-development practices, a scene where contending forms of power are evoked and practised. In Dr. Berger’s Immune Power Diet, the ‘invincible you’ is urged to ‘put immune power to work for you’ by using your ‘IQ (Immune Quotient)’ (Berger, 1985, p. 186). In the great tradition of evangelical preaching, the reader is asked if ‘You are ready to make the immune power commitment?’ (1985, p. 4). In visualization self-help, the sufferer learns in a state of deep relaxation to image the processes of disease and healing, in order both to gain more control in many senses and to engage in a kind of meditation on the meanings of living and dying from an embodied vantage point in the microplaces of the postmodern body. These visualization exercises need not be prototypes for Star Wars, but they often are in the advice literature. The National Geographic endorses this approach in its description of one such effort: ‘Combining fun and therapy, a young cancer patient at the M. D. Anderson Hospital in Houston, Texas, zaps cancer cells in the “Killer T Cell” video game’ (Jaret, 1987, p. 705). Other researchers have designed protocols to determine if aggressive imagery is effective in mediating the healing work of visualization therapies, or if the relaxation techniques and non-aggressive imagery would ‘work’. As with any function, ‘work’ for what cannot remain unexamined, and not just in terms of the statistics of cancer survival. Imaging is one of the vectors in the ‘epidemics of signification’ spreading in the cultures of postmodern therapeutics. What is at stake is the kind of collective and personal selves that will be constructed in this organic-technical-mythic-textual semiosis. As cyborgs in this field of meanings, how can we’, late-twentieth-century Westerners, image our vulnerability as a window on to life?

Immunity can also be conceived in terms of shared specificities; of the semi-permeable self able to engage with others (human and non-human, inner and outer), but always with finite consequences; of situated possibilities and impossibilities of individuation and identification; and of partial fusions and dangers. The problematic multiplicities of postmodern selves, so potently figured and repressed in the lumpy discourses of immunology, must be brought into other emerging Western and multi-cultural discourses on health, sickness, individuality, humanity, and death.

The science fictions of the black American writer, Octavia Butler, invite
both sobering and hopeful reflections on this large cultural project. Drawing
on the resources of black and women's histories and liberatory movements,
Butler has been consumed with an interrogation into the boundaries of what
counts as human and into the limits of the concept and practices of claiming
'property in the self' as the ground of 'human' individuality and selfhood. In
Clay's Ark (1984) Butler explores the consequences of an extra-terrestrial
invasion of earth in the bodies of returned spacemen. The invaders
have become an intimate part of all the cells of the infected bodies, changing
human beings at the level of their most basic selves. The invaders have a
single imperative that they enforce on their hosts: replication. Indeed, Clay's
Ark reads like The Extended Phenotype; the invaders seem disturbingly like the
'ultimate' unit of selection that haunts the biopolitical imaginations of
postmodern evolutionary theorists and economic planners. The humans in
Butler's profoundly dystopic story struggle to maintain their own areas of
choice and self-definition in the face of the disease they have become. Part
of their task is to craft a transformed relation to the 'other' within themselves
and to the children born to infected parents. The offsprings' quadruped
form archetypically marks them as the Beast itself, but they are also the
future of what it will mean to be human. The disease will be global. The task
of the multi-racial women and men of Clay's Ark comes to be to reinvent the
dialectics of self and other within the emerging epidemics of signification
signalled by extra-terrestrialism in inner and outer space. Success is not
judged in this book; only the naming of the task is broached.

In Dawn, the first novel of Butler's series on Xenogenesis, the themes of
global holocaust and the threateningly intimate other as self emerge again.
Butler's is a fiction predicated on the natural status of adoption and the
unnatural violence of kin. Butler explores the interdiggitations of human,
machine, non-human animal or alien, and their mutants, especially in
relation to the intimacies of bodily exchange and mental communication.
Her fiction in the opening novel of Xenogenesis is about the monstrous fear
and hope that the child will not, after all, be like the parent. There is never
one parent. Monsters share more than the word's root with the verb 'to
demonstrate'; monsters signify. Butler's fiction is about resistance to the
imperative to recreate the sacred image of the same (Butler, 1978). Butler is
like 'Doris Lessing, Marge Piercy, Joanna Russ, Ursula LeGuin, Margaret
Atwood, and Christa Wolf, [for whom] reinscribing the narrative of
catastrophe engages them in the invention of an alternate fictional world in
which the other (gender, race, species) is no longer subordinated to the
same' (Brewer, 1987, p. 46).

Catastrophe, survival, and metamorphosis are Butler's constant themes.
From the perspective of an ontology based on mutation, metamorphosis, and
the diaspora, restoring an original sacred image can be a bad joke. Origins
are precisely that to which Butler's people do not have access. But patterns
are another matter. At the end of Dawn, Butler has Lilith - whose name
recalls her original unfaithful double, the repudiated wife of Adam -
pregnant with the child of five progenitors, who come from two species, at
least three genders, two sexes, and an indeterminate number of races.
Preoccupied with marked bodies, Butler writes not of Cain or Ham, but of
Lilith, the woman of colour whose confrontations with the terms of selfhood,
survival, and reproduction in the face of repeated ultimate catastrophe
prises an ironic salvation history, with a salutary twist on the promise of a
woman who will crush the head of the serpent. Butler's salvation history is
not utopian, but remains deeply furrowed by the contradictions and
questions of power within all communication. Therefore, her narrative has
the possibility of figuring something other than the Second Coming of the
sacred image. Some other order of difference might be possible in
Xenogenesis - and in immunology.

In the story, Lilith Iyapo is a young American black woman rescued with a
mote of communicants of remnants of humanity from an earth in the grip of
nuclear war. Like all the surviving humans, Lilith has lost everything. Her
son and her second-generation Nigerian-American husband had died in an
accident before the war. She had gone back to school, vaguely thinking she
might become an anthropologist. But nuclear catastrophe, even more
radically and comprehensively than the slave trade and history's other great
genocides, ripped all rational and natural connections with past and future
from her and everyone else. Except for intermittent periods of questioning,
the human remnant is kept in suspended animation for 250 years by the
Oankali, the alien species that originally believed humanity was intent on
committing suicide and so would be far too dangerous to try to save. Without
human sensory organs, the Oankali are primatoid Medusa figures, their
heads and bodies covered with multi-talented tentacles like a terran marine
invertebrate's. These humanoid serpent people speak to the woman and
urge her to touch them in an intimacy that would lead humanity to a
monstrous metamorphosis. Multiply stripped, Lilith fights for survival,
agency, and choice on the shifting boundaries that shape the possibility of
meaning.

The Oankali do not rescue human beings only to return them unchanged
to a restored earth. Their own origins lost to them through an infinitely long
series of mergers and exchanges reaching deep into time and space, the
Oankali are gene traders. Their essence is embodied commerce, conversa-
tion, communication - with a vengeance. Their nature is always to be
midwife to themselves as other. Their bodies themselves are immune and
genetic technologies, driven to exchange, replication, dangerous intimacy
across the boundaries of self and other, and the power of images. Not unlike
political, as opposed to the grammatical, lexicon. The non-naturalness of race – it is always and totally an arbitrary, cultural construction – can be emphasized from the lack of a linguistic marker. But, as easily, the total collapse of the category of race into biologism is linguistically invited. All these matters continue to hinge on unexamined functioning of the productionist, Aristotelian logic fundamental to so much Western discourse. In this linguistic, political, and historical matrix, matter and form, act and potency, raw material and achieved product play out their escalating dramas of production and appropriation. Here is where subjects and objects get born and endlessly reincarnated.

Although not mutually exclusive, the language of ‘gender’ in Euro-American feminist discourse usually is the language of ‘sexed subject position’ and ‘sexual difference’ in European writing. For British Marxist feminism on the ‘sexed subject in patriarchy’, see Kuhn and Wolfe (1978). Marxist-Feminist Literature Collective (1978), Brown and Adams (1979), the journal MFJ; Barrett (1980). German socialist-feminist positions on sexualization have stressed the dialectic of women’s self-constructing agency, already structured social determinations, and partial restructurings. This literature examines how women construct themselves into existing structures, in order to find the point where change might be possible. If women are theorized as passive victims of sex and gender as a system of domination, no theory of liberation will be possible. So social constructionism on the question of gender must not be allowed to become a theory of closed determinism (Haug, 1980, 1982; Haug et al., 1983, 1987; Mouffe, 1983). Looking for a theory of experience, of how women actively embody themselves, the women in the collective writing the Frauenformen publications insisted on a descriptive/theoretical practice showing ‘the ways we live ourselves in bodily terms’ (Haug et al., 1987, p. 30). They evolved a method called ‘memory work’ that emphasizes collectively criticized, written narratives about ‘a stranger’, a past ‘remembered’ self, while problematizing the self-deluding assumptions of autobiography and other causal accounts. The problem is to account for the emergence of ‘the sexual itself as the process that produces the insertion of women into, and their subordination within, determinate social practices’ (p. 33). Ironically, self-constituted as sexualized, as woman, women cannot be accountable for themselves or society (p. 27). Like all the theories of sex, sexuality, and gender surveyed in this effort to write for a standard reference work that inevitably functions to canonize some meanings over others, the Frauenformen versions insist on gender as a gerund or a verb, rather than a finished noun, a substantive. For feminists, gender means making and unmaking ‘bodies’ in a contestable world; an account of gender is a theory of experience as signifying and significant embodiment.

Joan Scott (1988, pp. 28–90) wrote an incisive treatment of the development of gender as a theoretical category in the discipline of history. She noted the long history of play on the grammatical gender difference for making figurative allusions to sex or character (p. 28). Scott quoted as her epigram Fowler’s Dictionary of Modern English Usage’s insistence that to use gender to mean the male or female sex was either a mistake or a joke. The ironies in this injunction abound. One benefit of the inheritance of feminist uses of gender from grammar is that, in that domain, ‘gender is understood to be a way of classifying phenomena, a socially agreed-upon system of distinctions, rather than an objective description of inherent traits’ (p. 29).

See Coward (1983, chs 5 and 6) for a thorough discussion of the concepts of the family and the woman question in Marxist thought from 1848 to about 1930.


See The Woman Question (1971); Marx and Aveling (1883–6); Kollontai (1977).


Several streams of European feminisms (some disavowing the name) were born after the events of May ’68. The stream drawing from Simone de Beauvoir’s formulations, especially work by Monique Wittig, Monique Plaza, Colette Guillaumain, and Christine Delphy, published in Questions féministes, Nouvelles questions féministes, and Féminist Issues, and the stream associated complexly with the group ‘Psychanalyse et Politique’ and/or with Julia Kristeva, Luce Irigaray, Sarah Kofman, and Helène Cixous have been particularly influential in international feminist development on issues of sexual difference. (For introductory summaries, see Marks and de Courthion, 1980; Gallop, 1982; Moi, 1985; Duchen, 1986). These streams deserve large, separate treatments; but in the context of this entry two contributions to theories of ‘gender’ from these writers, who are deeply opposed among themselves on precisely these issues, must be signalled. First, there are Wittig’s and Delphy’s arguments for a materialist feminism, which insist that the issue is ‘domination’, not ‘difference’. Second, there are Irigaray’s Kristeva’s, and Cixous’s various ways (intertextually positioned in relation to Derrida, Lacan and others) of insisting that the subject, which is perhaps best approached through writing and textuality, is always in process, always disrupted, that the idea of woman remains finally unclosed and multiple. Despite their important opposition between and within the francophone streams, all these theorists are possessed with flawed, contradictory, and critical projects of denaturalization of ‘woman’.


Similarly, it is an error to equate ‘race’ with people of colour; whiteness is a racial construction as well, invisible as such because of its (like man’s) occupation of the unmarked category (Frankenberg, 1988; Carby, 1987, p. 18; Haraway, 1991b, pp. 152, 401–2).

See, for example, Ware (1970); Combahee River Collective (1979); Bethel and Smith (1979); Joseph and Lewis (1981); hooks (1981, 1984); Moraga and Anzaldúa (1981); Davis (1982); Hull et al. (1982); Lorde (1982, 1984); Apheker (1982); Moraga (1983); Walker (1983); Smith (1983); Balkin et al. (1984); Sandová (n.d.); Christian (1985); Giddings (1983); Anzaldúa (1987); Carby (1987); Spillers (1987); Collins (1989a, 1989b); Hurtado (1989).

8 A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century


The people associated with the History of Consciousness Board of UCSC have had an enormous influence on this paper, so that it feels collectively authored more than most, although those 1 cite may not recognize their ideas. In particular, members of
A provocative, comprehensive argument about the politics and theories of ‘postmodernism’ is made by Fredric Jameson (1984), who argues that postmodernism is not an option, a style among others, but a cultural dominant requiring radical redefinition of left politics from within; there is no longer any place from without that gives meaning to the comforting fiction of critical distance. Jameson also makes clear why one cannot be for or against postmodernism, an essentially moralist move. My position is that feminists (and others) need continuous cultural reinvention, postmodernist critique, and historical materialism; only a cyborg would have a chance. The old dominations of white capitalist patriarchy seem nostalgically innocent now; they normalized heterogeneity, into man and woman, white and black, for example. ‘Advanced capitalism’ and postmodernism release heterogeneity without a norm, and we are flattened, without subjectivity, which requires depth, even unfriendly and drowning depths. It is time to write The Death of the Clinic. The clinic’s methods required bodies and works; we have texts and surfaces. Our dominations don’t work by medicalization and normalization any more; they work by networking, communications redesign, stress management. Normalization gives way to automation, utter redundancy. Michel Foucault’s Birth of the Clinic (1963), History of Sexuality (1976), and Discipline and Punish (1975) name a form of power at its moment of implosion. The discourse of biopolitics gives way to technobabble, the language of the spliced substantive; no norm is left whole by the multinational. These are their names, listed from one issue of Science: Tech-Knowledge, Genestetch, Allergen, Hybritech, Compupro, Genen-corp, Syntax, Allelix, Agrigenetics Corp., Synagro, Codan, Repligen, MicroAngelo from Scion Corp., Percom Data, Inter System, Cyborg Corp., Statcom Corp., Intertec. If we are imprisoned by language, then escape from that prison-house requires language poets, a kind of cultural restriction enzyme to cut the code; cyborg heteroglossia is one form of radical cultural politics. For cyborg poetry, see Perloff (1984); Fraser (1984). For feminist modernist/postmodernist ‘cyborg’ writing, see HOW(ever), 871 Corbett Ave, San Francisco, CA 94131.

Baudrillard (1983). Jameson (1984, p. 66) points out that Plato’s definition of the simulacrum is the copy for which there is no original, i.e., the world of advanced capitalism, of pure exchange. See Disenawry (Spring/Summer 1987) for a special issue on technology (cybernetics, ecology, and the postmodern imagination).

For ethnographic accounts and political evaluations, see Epstein (forthcoming), Sturgeon (1968). Without explicit irony, adopting the spaceship earth/whole earth logo of the planet photographed from space, set off by the slogan ‘Love Your Mother’, the May 1987 Mothers and Others Day action at the nuclear weapons testing facility in Nevada none the less took account of the tragic contradictions of views of the earth. Demonstrators applied for official permits to be on the land from officers of the Western Shoshone tribe, whose territory was invaded by the US government when it built the nuclear weapons test ground in the 1950s. Arrested for trespassing, the demonstrators argued that the police and weapons facility personnel, without authorization from the proper officials, were the trespassers. One affinity group at the women’s action called themselves the Surrogate Others; and in solidarity with the creatures forced to tunnel in the same ground with the bomb, they enacted a cyborgian emergence from the constructed body of a large, non-heterosexual desert worm.


On orientalism in feminist works and elsewhere, see Lowe (1986); Said (1978); Mohanty (1984); Many Voices, One Chant: Black Feminist Perspectives (1984).

Katie King (1986, 1987a) has developed a theoretically sensitive treatment of the
workings of feminist taxonomies as genealogies of power in feminist ideology and polemic. King examines Jaggar's (1983) problematic example of taxonomizing feminisms to make a little machine producing the desired final position. My caricature here of socialist and radical feminism is also an example.

The central role of object relations versus psychoanalysis and related strong universalizing moves in discussing reproduction, caring work, and mothering in many approaches to epistemology underline their authors' resistance to what I am calling postmodernism. For me, both the universalizing moves and these versions of psychoanalysis make analysis of 'women's place in the integrated circuit' difficult and lead to systematic difficulties in accounting for or even seeing major aspects of the construction of gender and gendered social life. The feminist standpoint argument has been developed by: Flax (1983), Harding (1986), Harding and Hintikka (1983), Hartsocx (1983, b), O'Brien (1981), Rose (1983), Smith (1974, 1979). For rethinking theories of feminist materialism and feminist standpoints in response to criticism, see Harding (1986, pp. 163–96), Hartsocx (1987), and H. Rose (1986).

I make an argumentative category error in 'modifying' MacKinnon's positions with the qualifier 'radical', thereby generating my own reductive critique of extremely heterogeneous writing, which does explicitly use that label, by my taxonomically interested argument about writing which does not use the modifier and which brooks no limits and thereby adds to the various dreams of a common, in the sense of univocal, language for feminism. My category error was occasioned by an assignment to write from a particular taxonomic position which itself has a heterogeneous history, socialist-feminism, for Sociologist Review. A critique indebted to MacKinnon, but without the reductionism and with an elegant feminist account of Foucault's paradoxical conservatism on sexual violence (rape), is de la Lauretis (1983; see also 1986, pp. 1–19). A theoretically elegant feminist social-historical examination of family violence, that insists on women's, men's, and children's complex agency without losing sight of the material structures of male domination, race, and class, is Gordon (1988).

This chart was published in 1985. My previous efforts to understand biology as a cybernetic command-control discourse and organisms as 'natural-technical objects of knowledge' were Haraway (1979, 1983, 1984). The 1979 version of this dichotomous chart appears in this vol., ch. 3; for a 1989 version, see ch. 10. The differences indicate shifts in argument.

For progressive analyses and action on the biotechnology debates: GeneWatch, a Bulletin of the Committee for Responsible Genetics, 3 Dane St, 4th Floor, Boston, MA 02116; Genetic Screening Study Group (formerly the Sociobiology Study Group of Science for the People), Cambridge, MA; Wright (1986, 1986); Yoon (1983).


For the 'homework economy outside the home' and related arguments: Gordon (1983), Gordon and Kimball (1988); Stacey (1987); Reskin and Hartmann (1986); Women and Poverty (1984); S. Rose (1986); Collins (1982); Burr (1982); Gregory and Nussbaum (1982); Piven and Coward (1982); Microelectronics Group (1980); Stallard et al. (1985) which includes a useful organization and resource list.

The conjunction of the Green Revolution's social relations with biotechnologies like plant genetic engineering makes the pressures on land in the Third World increasingly intense. AID's estimates (New York Times, 14 October 1984) used at the 1984 World Food Day are that in Africa, women produce about 90 per cent of rural food supplies, about 60–80 per cent in Asia, and provide 40 per cent of agricultural labour in the Near East and Latin America. Blumberg charges that world organizations' agricultural politics, as well as those of multinationals and national governments in the Third World, generally ignore fundamental issues in the sexual division of labour. The present tragedy of famine in Africa might owe as much to male supremacy as to capitalism, colonialism, and rain patterns. More accurately, capitalism and racism are usually structurally male dominant. See also Blumberg (1981); Hacker (1984); Hacker and Iliev (1981). Busch and Lacy (1982), Willed (1982); Sachs (1983); International Fund for Agricultural Development (1983); Bird (1984).

See also Enloe (1983a, b).

For a feminist version of this logic, see Hrdy (1981). For an analysis of scientific women's story-telling practices, especially in relation to sociobiology in evolutionary debates around child abuse and infanticide, see this vol., ch. 5.


For guidance for thinking about the political/cultural/racial implications of the history of women doing science in the United States see: Haas and Percelli (1984); Hacker (1981); Keller (1983); National Science Foundation (1988); Rossiter (1983); Schiebinger (1987); Haraway (1985b).


But all these poets are very complex, not least in their treatment of themes of lying and erotic, decentered collective and personal identities. Griffin (1978), Lorde (1984), Rich (1978).


The sharp relation of women of colour to writing as theme and politics can be approached through: Program for 'The Black Woman and the Diaspora: Hidden Connections and Extended Acknowledgments', An International Literary Conference, Michigan State University, October 1983; Evans (1984); Christian (1983); Carby (1987); Fisher (1983); Frontier (1980, 1982); Kingston (1983); Lerner (1973); Giddings (1983); Moraga and Anzaldúa (1981); Morgan (1983). Anglophone European and Euro-American women have also crafted special relations to their writing as a potent sign: Gilbert and Gubar (1979); Russ (1983).

The convention of ideologically taming militarized high technology by publicizing its applications to speech and motion problems of the disabled/differently abled takes on a special irony in monotheistic, patriarchal, and frequently anti-Semitic culture when computer-generated speech allows a boy with no voice to chant the Hafizrah at his bar mitzvah. See Sussman (1986). Making the always context-relative social definitions of
Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective

This chapter originated as a commentary on Harding (1986), at the Western Division meetings of the American Philosophical Association, San Francisco, March 1987. Support during the writing of this paper was generously provided by the Alpha Fund of the Institute for Advanced Study, Princeton, New Jersey. Thanks especially to Joan Scott, Rayna Rapp, Judy Newton, Judy Butler, Lila Abu-Lughod, and Dorinne Kondo.

For example, see Knorr-Cetina and Mulkay (1983); Bijker et al. (1987); and especially, Latour (1984, 1988). Borrowing from Michel Tournier's Vendredi (1967), Latour's brilliant and maddening aphoristic polemic against all forms of reductionism makes the essential point for feminists: 'Méfiez-vous de la pureité; c'est le viriol de l'âme' (Latour, 1984, p. 171). Latour is not otherwise a notable feminist theorist, but he might be made into one by readings as perverse as those he makes of the laboratory, that great machine for making significant mistakes faster than anyone else can, and so gaining world-changing power. The laboratory for Latour is the railroad industry of epistemology, where facts can only be made to run on the tracks laid down from the laboratory out. Those who control the railways control the surrounding territory. How could we have forgotten? But now it's not so much the bankrupt railroads we need as the satellite network. Facts run on lightbeams these days.

For an elegant and very helpful elucidation of a non-cartoon version of this argument, see White (1987). I still want more; and unfulfilled desire can be a powerful seed for changing the stories.

In her analysis exploring the fault line between modernism and postmodernism in ethnography and anthropology — in which the high stakes are the authorization or prohibition to craft comparative knowledge across 'cultures', from some epistemologically grounded vantage point either inside, outside, or in dialogical relation with any unit of analysis — Marilyn Strathern (1987a) made the crucial observation that it is not the written ethnography that is parallel to the work of art as object-of-knowledge, but the culture. The Romantic and modernist natural-technical objects of knowledge, in science and in other cultural practice, stand on one side of this divide. The postmodernist formation stands on the other side, with its 'anti-aesthetic' of permanently split, problematized, always receding and deferred 'objects' of knowledge and practice, including signs, organisms, systems, selves, and cultures. 'Objectivity' in a postmodern frame cannot be about unproblematic objects; it must be about specific prosthesis and translation. Objectivity, which at root has been about crafting comparative knowledge (how to name things to be stable and to be like each other), becomes a question of the politics of redrawing of boundaries in order to have non-innocent conversations and connections. What is at stake in the debates about modernism and postmodernism is the pattern of relationships between and within bodies and language.

Zoe Sofoulis (1988) has produced a dazzlingly (she will forgive me the metaphor) theoretical treatment of technoscientific, the psychoanalysis of science fiction culture, and the metaphors of extra-terrestrialism, including a wonderful focus on the ideologies and philosophies of light, illumination, and discovery in Western myths of science and technology. My essay was revised in dialogue with Sofoulis's arguments and metaphors in her PhD dissertation.


John Varley's science fiction short story called 'The Persistence of Vision' is part of the inspiration for this section. In the story, Varley constructs a utopian community designed and built by the deaf-blind. He then explores these people's technologies and other mediations of communication and their relations to sighted children and visitors (Varley, 1978). In 'Blue Champagne', Varley (1986) transmutes the theme to interrogate the politics of intimacy and technology for a paraplegic young woman whose prosthetic device, the golden gypsy, allows her full mobility. But since the infinitely costly device is owned by an intergalactic communications and entertainment empire for which she works as a media star making 'telesc', she may keep her technological, intimate, enabling, other self only in exchange for her complicity in the commodification of all experience. What are her limits to the reinvention of experience for sale? Is the personal political under the sign of simulation? One way to read Varley's repeated investigations of finally always limited embodiments, differently abled beings, prosthetic technologies, and cyborgian encounters with their finitude despite their extraordinary transcendence of 'organic' orders is to find an allegory for the personal and political in the historical mythic time of the late twentieth century, the era of techno-biopolitics. Prosthesis becomes a fundamental category for understanding our most intimate selves. Prosthesis is semiosis, the making of meanings and bodies, not for transcendence but for power-charged communication.

I owe my understanding of the experience of these photographs to Jim Clifford, University of California at Santa Cruz, who identified their 'land hol' effect on the reader.

Joan Scott reminded me that Teresa de Lauretis (1986a, pp. 14-15) put it like this:

'Differences among women may be better understood as differences within women ... But once understood in their constitutive power — once it is understood, that is, that these differences not only constitute each woman's consciousness and subjective limits but all together define the female subject of feminism in its very specificity, its inherent and at least for now irreconcilable contradiction — these differences, then, cannot be again collapsed into a fixed identity, a sameness of all women as Woman, or a representation of Feminism as a coherent and available image.'

Harding (1986, p. 18) suggested that gender has three dimensions, each historically specific: gender symbolism, the social-sexual division of labour, and processes of constructing individual gendered identity. I would enlarge her point to note that there is no reason to expect the three dimensions to co-vary or co-determine each other, at least not directly. That is, extremely steep gradients between contrasting terms in gender symbolism may very well not correlate with sharp social-sexual divisions of labour or social power, but may be closely related to sharp racial stratification or something else. Similarly, the processes of gendered subject formation may not be directly illuminated by knowledge of the sexual division of labour or the gender symbolism in the particular historical situation under examination. On the other hand, we should expect mediated