

**Simulated Sovereignty, Telematic Territoriality:
The Political Economy of Cyberspace**

Timothy W. Luke
Department of Political Science
Virginia Polytechnic Institute
and State University
Blacksburg, VA

Presented at the Second Theory, Culture & Society Conference,
"Culture and Identity: City, Nation, World"
August 10-14, 1995

O. An Overview

This paper develops some provisional ideas about the political economy of cyberspace. Given how rapidly cyberspaces are forming from the fusion of computers with wired and wireless telecommunication networks all over the world, we should investigate the economic and political questions being raised by cyberspatialization as well as consider what alternative types of individual and collective subjectivity become possible in these domains. The proliferation of bit-generated spaces and places opens new sites for cultural contestation, economic exploitation, and institutional organization, which might radically transform the everyday politics of human agency and social structure. This analysis reconsiders where this is happening, how it has happened, what might happen next as the political economy of cyberspace evolves.

Cyberspaces, however, require a new sensibility--perhaps "postmodern" (Jameson, 1991), maybe "amodern" (Latour, 1993). Their spatial emulations are generated and carried by vast interated networks of computer networks, and their operational architectures now set fresh limits on space, defining who are inside/outside, access-granted/access-denied, platform-compatible/platform-incompatible, operational/inoperable. Network connectivity, then, becomes a new locus for social conflict as systems operators/on-line servers/network traffickers are enjoined either to do X or not to do Y to halt pornography,

wire fraud, hacking, or electronic theft. Authority and its powers of rule-making, rule-applying, or rule interpreting devolves to network managers, slipping away from traditional political jurisdictions that cling to the illusion that cyberspaces served on their territory adhere precisely to their legalities. These contradictions between "virtual life" (VL) and "real life" (RL) are a central concern in the following analysis.

I. Cyberspace, or Nature: First, Second, Third

Cyberspace is not a notion about things to come; it marks the material condition of things at work today. An accurate census of Internet users needs to be updated daily or weekly, not monthly or yearly, to keep track of its exponential growth. Already many millions of mainframe and personal computers are linked into this network, directly or through other smaller networks, but how many users actually use the Internet from these points-of-entry is less clear. Numbers can be cited, but they are inaccurate even when reported. Basically, user numbers are higher, much higher, than mere machine counting can suggest. Most of the world's money, much of its communication, transportation, and distribution system, and all data analysis now either moves in or materially assisted by operations conducted in cyberspace. It becomes important to ask how, why, and where cyberspaces are transforming the everyday life of contemporary economies, societies and states by providing the possibilities for a digital being.

Cyberspaces are, in one sense, another practical manifestation of Nature's pluralization. Human technical artifice has the capacity to reshape environmental settings through purposive-rational action, as illustrated traditionally by the second nature of technological artifice fabricated out of humans' industrial and agricultural activity (Attali, 1991). Informationalization goes one more iteration beyond the technical artifice of second nature, creating the hyperreal domain of cybernetic/telematic/digitalized third nature. The physical environment of first nature as well as the artificial environments of second nature can be supplemented by digital environments in a new third nature.

Stories of space and place typically unfold within variously historicized readings of Nature (Blackburn, 1990). Power acts, boundaries get fixed, and space can be created on terrains with particular natural properties (Luke, 1993: 299-258). Nature's varying terrains might be pluralized, and then differentiated in terms of "firstness" and "secondness" (Lukács, 1971: 8-149), and human presence has been located in the interplay of two modes of nature's influence (Smith, 1984). Humanity's existence in the "first nature", which is seen as cosmogenic or theogenic, during human prehistory and antiquity traditionally has provided a point of origin and field of action for human communities, which they share with all organic life. First nature, then, gains its identity from the varied terrains forming the

bioscape/ecoscape/geoscape of terrestriality. Earth, water, and sky provide the basic elements mapped in physical geographies of the biosphere/geosphere that, in turn, influence human life with natural forces. In this representation of nature as first nature, as Smith suggests, "nature is generally seen as precisely that which cannot be produced; it is the antithesis of human productive activity....the natural landscape presents itself to us as the material substratum of daily life, the realm of use-values rather than exchange values" (1984: 32).

Against these primary fields, humanity's actions in first nature transform it. And, a new anthropogenic domain in the "second nature" of an artificial technosphere has become more significant in recent historical times during the modern/capitalist/industrial era (Agnew, 1987). The sense of human power, space, order, time, value, and community now considered "normal" derives from human societies building their communities, as well as states forming their regimes, within the second nature manufactured out of modern science, capitalist exchange, and industrial technology on a world-wide scale (Poggi, 1978: 1-3). In the expanses of second nature, "this material sub-stratum is more and more the product of social production, and the dominant axes of differentiation are increasingly social in origin....the development of the material landscape presents itself as a process of the production of nature" (Smith, 1984: 32). The nation-state, mass society, and global geopolitics all

are historical artifacts of constructing, and then conquering, the built environments and social spaces of second nature. Second nature, therefore, finds realization in the diverse what is built environment is built out of matter; atoms are reordered in its anthropogenic operations. People, cities, economies, states constitute the objects charted in cultural, economic, and political geographies of this elaborate technosphere, while human action and agency acquire new characteristics beyond those possible in first nature alone (Corbridge, Martin, Thrift, 1994).

The epistemic realism of conventional disciplinary discourses as well as essentially follows the fixed regularities implied by these accounts of first and second nature (Onuf, 1989: 1-65). Nature as setting in these contexts had its own peculiar predictability in these constructs. Prevailing notions of power, subjectivity, and community, however, cannot grasp many of the latest changes happening now in the industrial technosphere of second nature and ecological biosphere of first nature as these elaborate human constructions of Nature's qualities are being overlaid, interpenetrated, and reconstituted with the "third nature" of an informational cybersphere/telesphere. As Vattimo argues, "the society in which we live is a society of generalized communication. It is a society of the mass media" (1992: 1). Here, the setting of action and agency is shaken completely. Power shifts focus, speed overcomes space, orders become disordered, time moves standards, community loses centers, values

change denomination. Third nature, at this juncture, assumes its forms of rationalization in the cyberscape/infoscape/mediascape of telemetricity. It is an anthropogenic domain, but its structure is built more from bits rather than atoms. If, as Smith contends, "it is in the production of nature that use-value and exchange-value, and space and society, are fused together" (1984: 32), then third nature recombines society and space in producing new exchange-values in unprecedented ways from the use-values of the electromagnetic spectrum, the industrial era's telecommunication infrastructures, and the contemporary restructuring of labor and leisure (Luke, 1989).

Even so, "as a social product," the spatiality of third nature remains, like first and second nature, "simultaneously the medium and outcome, presupposition and embodiment, of social action and relationship" (Soja, 1989: 129). Digital emissions, analog waves, image streams, and information currents, which swirl through new telemetric/televisual/teledigital/telegraphic/telephonous flows, now emerge as features to be imaged/traced/tracked by yet to be developed informational, cybernetic, semiological, and telematic geographies of the cybersphere/telescope (Castells, 1989). Digitalization shifts human agency and structure to a register of informational bits from one of manufactured matter. With this eruption of change, the conflicts of humans against Nature, other humans, and themselves are recast as these geographic settings

twist and turn in new unforeseen directions. Most importantly, the setting of space, the character of power, and the structure of order need some more elaborate interpretations to mark the differences between the present and the past as drawn by this emergent third nature, especially in its cyberspatial domains.

In the technosphere of second nature, "global" and "local" are a meaningful opposition of different scales and contraposed sites defined by the distances separating them. State powers have organized the world in such a way that global and local are two ends of a geographic continuum divided by, but defined through the national. The perspectival space and neutral time of political realism, however, are slipping away into many more postperspectival visions of place and new rhythmic markings of time (Toulmin, 1990). The oral, particular, local, and timely agendas of extra-statist social forces, set loose in the informationalizing forces of third nature's hyperreality, are contesting the written, general, universal, and timeless line of statist authorities. This pluralizing the subjects and objects of communication in the proliferating networks of information "renders any unilinear view of the world and history impossible" (Vattimo, 1992: 6). And, as a result, it is becoming difficult, or even impossible, to abide by the conceptual categories imposed by orthodox discourses of political realism (Luke, 1994).

The epistemological foundations of conventional reasoning in terms of political realism are grounded in the modernist laws of

second nature. Beyond the outer or inner reaches of the industrial technosphere, do these epistemic visions of what is "real" hold true? Perhaps not. Some preliminary reasons for why it might be the case can be found in Baudrillard's observations about what has identified here as informational third nature, which gives a provisional understanding of the cybersphere as systems of simulation running off on lines of hyperreality (Baudrillard, 1983b). Simulation systems of hyperreality arise from the televisual/cybernetic evaporation of modern representational differences between true and false, concept and object, real and representation. One must see everything anew in hyperreality: "No more mirror of being and appearances, of the real and its concept. No more imaginary coextensity: rather, genetic miniaturization is the dimension of simulation. The real is produced from miniaturized units, from matrices, memory banks and command models--and with these it can be reproduced an infinite number of times. It no longer has to be rational, since it is no longer measured against some ideal or negative instance. It is nothing more than operational. In fact, since it is no longer enveloped by an imaginary, it is no longer real at all. It is a hyperreal, the product of an irradiating synthesis of combinatory models in a hyperspace without atmosphere" (1983a: 3).

Simulation rests upon absence and negation, eliminating "the real" or "the true" by emulating their appearances as new kinds

of ontological givens in cyberspace. While systems of representation may endeavor to appropriate simulation as false representation, the dynamics of simulation turn representations into simulacra, reducing the sign to a valueless free radical capable of bonding anywhere in any symbolic exchange. Simulation in the global flow goes far beyond the old realist divisions of space and time, sender and receiver, medium and message, expression and content as the world's complex webs of electronic media generate new hyperspaces with "no sense of place." Third nature, then, is a complex of simulacra, copies of domains for which there are no stable originals. And, in these domains, many are constructing boundaries of bits, regimes on RAM, cultures from chips, dominions with disks, companies by code.

III. Cyberspatial Telemetricity

The fascination with cyberspace has evolved along with the development of networked computer systems over the past twenty-five years. Its social implications, of course, were anticipated or touted for years by informational theorists, ranging from Daniel Bell to Alvin Toffler, who talked incessantly about shifting from pushing "atoms" (matter) to generating "bits" (information). However, its larger possibilities arguably were not fully appreciated until cyberpunk science fiction writers, like William Gibson, set their stories in cyberspatial locales, which more sharply underscored the impact of cyberspaces with contemporary societies. As Gibson's Neuromancer records,

cyberspace gains definition as "a consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts....A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding" (1984: 51). Generated by the distributed interactive computing of innumerable networks, cyberspaces open to human perception and manipulation at whatever terminal interface--textual, graphic, audio, visual--can disclose all of these nonspaces of the mind, clusters and constellations of data.

All spaces are constructs, but physical space constructs have both materialized substance and artificial markers (Harvey, 1989). The humans who construct and occupy them intellectually or materially can gather there as to decipher them (Anderson, 1991). Cyberspaces, however, are generated out of some telecommunication/telecomputation network's operations as complex constructs of programming function, data systematization, communication interoperation, and computation emulation used to gather, store, manage or interpret data. All spaces are produced by human subjects and nonhuman objects, but cyberspace forces human beings to reconceptualize their spatial situation inasmuch as they experience their positionalizations in cyberspace only as simulations. As a subjectivity-emulating non-human object or

data point/terminal action/data packet/telepresence, one flows through an objective domain of telecommunication/computation systems by fusing with software codes that simulate human subjectivities in their expert systems/intelligent agents/ voice synthesizers/core processors. By displacing human action into another domain, new sites of identity, community and sovereignty for human subjects emerge that are, on the one hand, linked to material realities, while working, on the other hand, much differently because of the operational properties of such cyberspatial constructs. Many evaluations of these possibilities fetishize the alienating potential estrangement of cyberspace and discount the equal plausible tendencies for familiarizing new communalization to develop on cyberspatial terrains. Digital forms of being, however, can unfix or refix identity and community equally well.

IV. Means of Digitalization in the Mode of Information

Cyberspace, at the same time, is more than a collective hallucination restricted to the symbolic domains of social superstructures. There is an immense material base underpinning its operations, which depends upon many complex technics. A vast armature of communication and computation technology is needed to link millions of personal computers through wired and wireless systems of transmission via microwave towers, communications satellites, fiberoptic networks, and on-line services. Once all of these links are up and operational, the joint interactivity of

all the components becomes a telemetrical domain in which cyberspatial virtual realities can be exploited. Consequently, who designs, owns, manages, operates all of the hardware needed to generate cyberspace is a key question, because significant power capabilities and profit potentials settle at these sites. The telemetricity of network construction/maintenance/development, in turn, permits cyberspaces to be imagined and utilized. While design intentions can be evaded or subverted, as most hacking practices indicate, the infostructures raised in cyberspace also begin to conventionalize how and why they are used by most of their clients.

The advocates of cyberspatialization, however, naturalize cyberspace, taking and then accepting it as a given that can and will be accessed at will by anyone astute and equipped enough to gain entry (Negroponte, 1995). The basic infrastructure costs of designing, building, operating, and maintaining are virtually unreal for most cyberspace theorists. Likewise, the power of those who own and control these systems of communication also is essentially ignored in cyberspace theory's zeal for touting its overall potential. Yet, the Net does not exist as such for free; it takes an immense amount of "net work" to make any Net work. And, it is this profit and power potential that drives telecom and computer firms to celebrate the inevitability of its ubiquity. Once everyone is on-line, most individual actions and

social institutions will require a metered telecom transaction and commodified computer apparatus to even occur. And, once they do occur, they will leave complete traces of every move in computer memories/phone charges/net connections.

None of these developments can be described as natural. There is an elaborate and dear political economy driving cyberspatial development, and it is entirely artificial: that is, historical/political/cultural/social forces are creating it.

The agents and structures imagining cyberspatialization as a "natural givenness" mostly stand to profit tremendously from every connection, line charge, network minute, computer terminal, and CD-ROM sold. Few moments in history see a possibility for pluralizing Nature, and the prospect of firms and individuals to create and own entire realms of hyperreal estate on-line has moved many to reimagine themselves and all computer literate users as possessing god-like attributes. Steward Brand, for example, sees a clear direction in cyberspatialization: "junior deities, we want to be. Reality is mostly given. Virtual reality is creatable." (1987: 116). With an estimated potential for generating \$3.5 trillion a year out of Net activity in the United States alone (Slouka, 1995: 11), such god talk is perhaps to be expected. And, with the profits derived from such dollar turnover, cyberspatial theorists might well naturalize their net connections because money, at least for them, will be no object. Indeed, some of them even imagine a new kind of immortality on

the Net after experiencing such power and profit. As John Barlow asserts, "when the yearning for human flesh has come to an end, what will remain? Mind may continue, uploaded into the Net, suspended in an ecology of voltage as ambitiously capable of self-sustenance as was its carbon-based forebears" (cited in Slouka, 1995: 11-12).

Along with the hyperhype, then, cyberspatialization portends immense changes for how societies produce wealth, order institutions, enliven agency or reproduce culture. Cyberspace may well be a vast cloud of code rising out of the images, numbers, words, and sounds on all of the fiberoptic lines and hard disks of the world, but without the material infrastructure carrying the wired and wireless signals of these symbolic infostructures cyberspatialization itself is impossible. This mediation of the mode of information through the productive forces or means of information must not be forgotten in the fascination with what cyberspace may become as a new psychosocial domain for human action.

V. Infostructures

The infostructural potential of cyberspaces as political economy implicitly is being recognized in many inchoate but widespread efforts to build on-line businesses, cybermalls, virtual classrooms, on-line libraries, info-cities, electronic villages, on-line banks, cybercourtrooms, or virtual townhalls (Mitchell, 1995). These metaphors typically prove to be poor

approximations of what actually might happen in such infostructures, when and if they are constructed. Never purely displacements of what happens in real time and space into cyberspace, these new cybernetic settings bring with them entirely new rhetorics, grammars, and imageries of representing and enacting individual and collective subjectivity in the confines of crude business, communications, or word processing software (Lyotard, 1984). Yet, these softworn subjectivities, whose characteristics are artifacts of hardware performance, software engineering, or machine language, now structure hyperreal estate formations as well as the cyberspatial subjects occupying these edifices in social relationships of commerce, learning, governance, or socializing. So instead of thrilling to the hype of infotouts, the new implications of on-line space and practice need to be reconsidered carefully.

Cyberspaces are essentially unbordered, ungoverned, and uncontrolled sites where individuals, groups or firms can engage essentially in any sort of activity virtually with little or no state supervision, auditing or boundary. Consequently, the development and exploitation of these spaces now poses remarkable challenges for all existing notions of territoriality, sovereignty, and economy. By purchasing server capacity, organizing software interactivity, and accepting networked connectivity, anyone can fabricate an on-line zone of virtual existence that is capable to hosting virtualizations of economic

exchange, social discourse, intellectual debate, sexual intercourse, ideological solidarity, cultural performance, religious observances, scientific conferences, or literary works. With encryption systems or limited access points, these spaces can be protected from most, if not all, unwanted outside interventions. With peculiar operating standards or exotic software requirements, the rules of interactivity can be tightly legislated by the owners/operators of the cyberspace. And, finally, with a structure of toll charges or special payment requirements, the cyberspace basically can function as an autarkic economy in which the currency of exchange, the rates of service, and the benefits of trade all can be controlled from within the cyberspatial domain (O'Brien, 1992). Indeed, after only a step or two of electronic conversion, huge sums of money--existing as packeted pulses of bits--can flow effortlessly from cyberspace to cyberspace in milliseconds amidst a building, over the back fence, across the nation or around the world (Taylor and Thrift, 1986). Control and surveillance can be exercised in the open public networks of transmission; but, once captured within closed proprietary or discrete encrypted networks of computer, these transactions are mostly immune from outside interference.

Telemetricity does not conform to territoriality, and states as territorial actors cannot expect automatic compliance from telemetrical operators inside or outside of their borders. Thus, states now confront potential on-line insurrections against

their traditional prerogatives everywhere and anywhere nonstatal actors generate these deterritorialized domains cyberspatially. Anyone with secure computer capacity and network connectivity can virtually secede from any material state formation's controls by cybernetically creating closed spaces, impermeable borders, autonomous regions, special currencies, and private rules.

VI. Dromoeconomics: Real Profits Through Virtual Speed

Cyberspaces also can channel the profitable turnover of "dromoeconomies," or modes of production organized around speeding flows of capital, labor, information, products, resources and techniques in virtual modes of production. Whatever can be produced as bits, of course, works well in the workings of the dromoeconomy. Atoms too can be tracked and targeted by cyberspatial virtual firms, although not as directly or constantly. So computer bar coding is being inscribed upon every possible existing commodity to exist their lines of flight through the virtual offices, factories, and stores of cyberspatialized commerce (Der Derian, 1990). The production of services and other informational commodities (legal contracts, product promotions, movie showings, scientific papers, etc.), however, can be conducted almost entirely on the Net through shareware packages or on-line services. Acknowledging the existence of all these factors in motion from multiple points of supply and demand, many corporate entities are virtualizing their operations, or hollowing out their once solid company structures

as bodies at rest engaged in shaping matter on site from start-to-finish, in order to generate corporate value-added outputs by monitoring/controlling/managing information about these dromoeconomic flows (Reich, 1991). Instead of creating territories of exclusive domination, they are fabricating telemetries of additive benefit about these global flows of capital, technique, information in VL to control workers, products, and resources in RL.

A. Virtualizing Capital: VL Becomes RL

Virtual firms, then, produce goods and services by creating knowledge about dromoeconomic flow-launch, flow-ballistics, flow-impact, which originates within or comes to their hollowed out structures much more easily. In a sense, like the structures that municipalities erect to attract the flows to their urban domains, virtual firms are shell buildings that coordinate their enterprise output as kanban capitalism, or just-in-time commerce, in which their information about how and when to assemble distillations of globally-sourced components for sale at local points-of-use equals their value-adding contribution to the process of production. Binary shells were invented by artillery and chemical warfare units to keep dangerous elements inert and stable until needed by mixing them in flight to activate particular chemical reactions. In a sense, many goods and services are becoming binary or polynomial shells in the kanban commerce of dromoeconomies. Many goods and services exist as

components in global flows, but they are unified only in flight from point-to-point by virtualized firms monitoring the flow of every business day. Cyberspaces in VL interweave with real life RL, flashing telemetries of surveillance information about territorially located factors of production. Knowledge about these energies-in-motion as well as how to launch, steer and target their impact now exceeds in profitability and importance control over bodies-at-rest, or models where firms still attempt to occupy markets by controlling resources and capital at rest in space.

Dromoeconomics are instead about getting products into informational motion through informed places, pulling together complex assemblies of outsourced components or servers just-in-time as customers individually expect them. Such mass customization through dromoeconomic organization increasingly eclipses mass standardization with conventional economic operations. These shifts away from manufacture toward digitafacture are rational responses to dromoeconomics. Rather than controlling the hands used to manually factor resources into products, firms intent upon virtualizing their operations aim to control digitized telemetries about production and consumption. Bits of data about strings of matter and flows of energy, then, can be guided to and from the most profitable sites of extraction/production/accumulation/circulation/consumption so that buyer/user gets what is needed at the time needed in the

amount needed--no more, no less.

Therefore, if one reimagines flows of the dromoeconomy as turbulence, chaos, or phased dynamics, cyberspaces--with their panoptic surveillance capabilities over these flows--permit economic enterprises to operate as singularities for decision-making, value-adding, profit-taking. The level of complexity in global trade, the number of internationally-arrayed competent producers, the depth of mass world markets, and the degree of freedom afforded by these multiple flows all prompt rational economic actors to move toward virtualizing their operations by trading in these cyberspaces. Of course, not all segments of all industries or markets can support virtualization; many goods and services must be produced locally in traditional ways for familiar needs. But, parts and pieces of even these products will undoubtedly incorporate out-sourced elements supplied from the turnover of the dromoeconomy.

B. Virtual Capital in RL

The enthusiasm that corporate enterprises display for cyberspatial projects is not difficult to understand. These domains increasingly are generated of/for/by corporate business activities, and they provide an unprecedented opportunity for firms to exercise their commercially-mediated authoritarian powers to determine who interacts with whom, when and how interactions occur, and why interactivity has what outcomes. Cyberspaces are not easily constructed by individuals, even on a

local area network basis, without considerable support for connectivity from corporate and/or government telecom services. Consequently, the third nature of cyberspatial hyperreal estate gives private firms and/or public agencies an unprecedented opportunity to exercise a form of private tyranny or public authoritarianism in setting all of the conditions and costs of entering, using, or traversing cyberspatial domains. These are the stakes typically celebrated in discussions of the "information superhighway" with its somewhat mystified deployment of "roads-and-bridges" infrastructure metaphors to discuss a new system of communicative structures that fit this language only inasmuch as such systems often are monopolistic networks of tollways, tollbooths, and tollrates that impede traffic as much as they facilitate it.

It is far more accurate to envision these undertakings as extraterritorial domains of telemetrical space, being turned into exclusive zones of service-provision, profit-generation, power-creation, or goods-invention by their corporate vendors. Unable to dominate territorial jurisdictions exclusively in second nature, corporate enterprises are essentially free to control telemetrical zones of control in third nature as their own exhaustively encrypted hyperreal estate within which they fabricate infostructures with very little regulation, oversight, or administration from without or above by state authorities. In an usually apt phrase, then, cyberspace easily can operate,

particularly once big corporate operations begin installing and drawing major profits out of large bandwidth networks, as MUDs--Multi-User Dungeons--in a literal sense as CompuServe creates "CompuServants" or American On-Line keeps "America in-line."

Cyberspaces provide concrete settings for organizing, steering, and utilizing dromoeconomic means of production as a rational strategy. In many ways, they arise out of a dromoeconomic system of manufacturing, and then link backwards to integrate all sources of supply-side factors as well as forwards to encompass as many points of demand-side consumers as possible.

The globalization of production in search of the cheapest supplies of labor, materials, and energy or the most profitable sites for design, finance, and marketing has facilitated the construction of intracorporate and intercorporate cyberspatial domains (Henderson and Castells, 1987). The concomitant proliferation of Internet users on networked office and home computing facilities has created a computer-accessible audience/market/public ready to use goods and services either initially presented as available options or actually delivered as merchandise through cyberspatial displays. Cyberspatial systems of psychodemographic tracking, kanban production, and niche marketing via networked informational surveillance are the requisites for a dromoeconomic sphere of circulation to emerge on a local and global level wherever buyers and sellers can port into a shared cyberspace.

C. Virtual Labor in RL

Labor itself can be displaced into cyberspace by generating dedicated infostructures for work in groupware packages, or as the buzzwords go, "virtual offices." These infotectural projects essentially capture a workplace, a work process, and a work project in code, enabling different workers or work teams to work independently or jointly on a common undertaking. The product of their labor can be stored in cyberspatial registers in its design, development, engineering, and testing phases, and then archived there to interface with computer-controlled manufacturing, assembly, and shipping systems. Groupware, then, virtualizes the factory as well as the enterprise, enabling the work process to develop at higher efficiencies by looping the best services into a shared system of labor at lower levels of cost.

Yet, these circuits of labor entirely change existing sociologies of work, which have assumed physical synchronous collocation in many instances to produce various goods and services. Once the work site becomes virtual, many work relations turn into virtualized ties that are much more tenuous than even prevailing industrial systems of labor. Increasingly, workers in such virtual enterprises may have to capitalize their own production by providing their own telecom links, computer work stations, or software capabilities. Or, if they do not supply their own tools, they still may have to provide their own

workplace for temporary assignments of enterprise-provided workstations. The product of one's labor no longer necessarily appears even temporarily as a physical presence or social interaction; instead, it is immediately embedded in a collective code system of all others equally alienated labor product as an ephemeral electronic enterprise. Labor relations with superiors, co-workers, outside vendors, and clients may be mediated entirely through network linkages, reducing each one to a telepresence dealing with other telepresences. As work becomes increasingly a system of temporary, outsourced, focused assignments, a new kind of global proletariat will emerge in rough constant competition amongst itself in continual bidding exchanges that rob workers of control over their time, energy and skills. Access to work can be easily blocked in these virtual economies by denying access to corporate groupware links, cutting network ties, or denying advanced software/hardware systems to troublesome elements. The virtual office and factory simply provide capital new ways to externalize costs upon others, enhance control over the work process, and enlarge potential profits.

Cybertech theorists, of course, celebrate these possibilities as a further expression of instrumentally rational lean-and-mean workplaces rising to even greater importance. Fortune magazine's Quarterly Report on Information Technology (May 15, 1995), for example, sees "knowledge workers, selling their labor to new species of business that will flourish in the

wired economy, may need to be ready to work at a moment's notice....such wired workers will form 'overnight armies of intellectual mercenaries'." Virtual firms will search global nets for talent, loop them into a task-oriented shareware space, combine labor, technology, capital and resources for a few days, weeks or months to produce the product, and then disband the workgroup as all push on into other projects. This vision may well be the perfect fantasy of certain corporate actors; yet, this virtual mode of production in the dromoeconomy seems likely to obliterate many current conventions pertaining to state sovereignty, workplace regulation, labor protection, government taxation, intellectual property, and national production inasmuch as they remain conceptualized as activities contained within and sheltered by territorialized space where discrete national agents and sovereign structures operate away from this dromoeconomy.

Indeed, this cyberspatial work site for the dromoeconomy uses speed and virtualization to take what it needs when it needs it from physiospatial agents and structures, whose locally provided education, public utilities, civic security or technical skills now will be skimmed away globally without necessarily adding much value or profit back to these nondromoeconomic settings. Virtual firms, then, appear to be organized around a model of uneven exchange between cyberspatial virtual commerce conducted within global dromoeconomies and actual traders rooted to RL mostly inside local steady-state economies. State

sovereignty with its presumed powers of labor protection, workplace regulation, technological licensing, business taxation, or market control over a discrete physiospace faces major obstacles to exerting its authority over virtual firms/workplaces/management that may operate for only a few hours or days in assembling transnational goods and services as flexible polynomial shells.

Thusfar, the speculation about such forms of work tends to be expressed by footloose journalists, who, more or less, envision it as being just like an ordinary job in terms of pay and benefits only without having to do compulsory seat time in one fixed point of work. Yet, these myths of telecommuting mystify the more problematic realities of dromoeconomics. Instead of these options providing tremendous choices for all workers as infomatic free agents, they mostly appear instead to become work-decomposing or value-reducing maneuvers for virtual firms. Consequently, the cyberspatial resources of global computer nets permit virtual enterprises to employ thousands of poor women in Jamaica, Mauritius or the Philippines in low-paid, tedious data entry or word processing jobs for firms in London, Paris or San Diego. Cyberspace allows dromoeconomic entrepreneurs to virtualize segments of a core workplace at these peripheral locations, while porting the telepresence of peripheral laborers into the productive systems of a core-based company. Even Time observes, "in the virtual office, paper has

disappeared--and so have most employees" (1995: 38).

VII. Virtual Politics: Recoding States as CyberNations

The imaginary representation of cyberspace, then, increasingly is developmental, imperialistic, and proprietary. From Al Gore's and Bill Clinton's evocation of the information superhighway during their 1992 presidential campaign to Newt Gingrich's vision of a wired republic, the informationalization of America has become the predominant myth for motivating economic development currently in the US. Likewise, Alvin and Heidi Toffler have turned touting the informationalization of society into a major think tank project, arguing that "cyberspace is the land of knowledge. And the exploration of that land can be a civilization's truest, highest calling." Yet, these territorializations of cyberspatial domains seem to reimagine the openness and anarchy of cyberspace as beckoning zones of exploration to be closed and ruled as American civilization's truest, highest calling. No surprisingly, then, Time's special cyberspace issue reports that "corporations...are scrambling to stake their claims in cyberspace. Every computer company, nearly every publisher, most communications firms, banks, insurance companies and hundreds of mail-order and retail firms are registering their Internet domains and setting up sites on the World Wide Web" (1995: 6). Thus, the connectivity and transparency of cyberspace already is slipping towards uses that extend the exclusive proprietary market logics of capitalistic

corporate territoriality into the regions of action made accessible by the Internet.

Yet, problems arise here. Virtualizing government by displacing its operations, as well as the electoral politics behind its empowerment or disempowerment, into cyberspaces begins to alter existing notions of state sovereignty, civic agency, public magistracy, and national territoriality. Teledemocracy will convene assemblies of telepresences, often asynchronously, either as desktop video talking heads, graphic avatars, or textual tracings. Direct democracy along the lines of classical Athens or Vermont town meetings presumes face-to-face debate, embodied participation, and synchronous collocation. Teledemocracy cannot efficaciously convene millions at once; and, even so, its convocations interpose hardware operational limits, network carrying capacity, and software rhetorical routines in between the democratic practices of its citizens. At best, the time limits and scale problems of teledemocracy would only seem to serve agendas of cybernetic referenda or telematic initiatives, creating a wired (or wireless) plebiscitary state. Admittedly, more information might become more open to more people in such systems, which is to be encouraged, but dreaming that cyberspaces will permit nation-states to emulate classical Athenian democracy is dangerous. Indeed, it may simply promote a similar destructive cycle between oligarchy and democracy by plebiscite.

If anyone can enter the res publica as a cyberspatial site, then what difference do territorialized containments of power, identity and community make. Now nationality is a function of nativity in space, one becomes a citizen by birth into a group residing in nationalized places in space. However, if the res publica becomes a hyperreal estate, and if one can as citizen or magistrate participate in its workings cyberspatially away from state buildings, political capitals or national territories, then does national identity and citizenship begin to flow from birth to forbearers with certain secure access (via passwords, encryption clearances, hardwired devices) to politicized regions of cyberspace? Clearly, this may well mean at end to certain kinds of privacy as some sort of indisputable identity card, or somatic profile of voice print, retinal image, photoimagery or finger print, would prove nationality and voting rights. In turn, voting might well become mandatory with positive and negative sanctions for varying levels of participation. Simply coexisting in space-and-time from birth will not necessarily create community; indeed, the mobility induced by dromoeconomic production would undoubtedly continue today's trends toward global and national migration. Thus, nationalized spaces may well be populated by even more expatriate, absentee voting, alien populations participating remotely via cyberspatial mediations in their "native" territory's civic life.

Certain public goods and services, however, have presumed

physical collocation to either produce or consume. Certainly, most people in many jurisdictions will not be so mobile; yet, many more than now may well be in motion more than the present. Cyberspatial structures may well provide for their welfare postterritorially through cyberschooling, cybermedical, cyberservice systems as well as a globally flexible electronic money system. Yet, if states face their own populations on the move in these numbers, and if they find large, diverse alien populations amidst their own, and if all of them are receiving such supporting services remotely via secure access into cyberspatial delivery structures, then how can they be seen as being in any sort of "exclusive control" of their national territorial domains? Or does the determinate political community become essentially constructed in cyberspace behind securely encrypted borders? And, if so, then institutions and structures beyond or beneath the nation-state might well prove to be more flexibly adapted to provide some kind of group identity, social services and public security to particular bodies of population.

The fact that it is the upper and middle classes that have on-line access to computer networks (19 million in North America, 6.4 million in Europe, .92 million in Asia, and .11 million in Central and South America) also suggests that the lower classes without access will continue to be treated as the undeserving poor, which no public agency may be obliged to care for any longer.

Cyberspaces, therefore, are problematic social sites. They are not truly "atopian," because a nowhere is truly a nullity. They have a material origin out of the electronic systems which generate their dimensionality through physically networked compilation and telecommunication apparatuses. In some sense, then, they are "ectopian," or outside of ordinary space, and open to multiple contradictory appropriations or misappropriations by those who create and then traverse their spatial properties. Like ordinary space, they generate value by allowing for varying levels of openness or closedness as well as fostering possibilities for intensive development with secondary structures, additional amenities or informatic improvements on/in their sites. They arguably are infinitely expansive, limited only by the number of connected network users, the capacity of network linkages, the speed of computational servers, or the storage capability of machine memory. Their constructed quality permits any suitably equipped person or group to fabricate additional ranges in cyberspace, while, at the same time, giving unusual freedom of agency and structure to those who fabricate such spaces. Once all or most of these sites are running together and linked up by networks as the site of VL, there are remarkable implications here for the conditions of identity, community and meaning prevailing still in RL as well as the operations of states, societies and cultures in all nonvirtualized, noncyberspatial settings. Indeed, VL begins to

destabilize what agency is within cyberspaces as new digital beings are produced by cyberspatialized political economies.

While computer savants, like Nicholas Negroponte, talk all about the exciting technological possibilities of "being digital," neither he nor other hardware experts consider the social potentials of the "digital being" that emerges in those cyberspatial domains where being digital gets put into digitized social practice (1995: 11-20). Cybernetic subjectivity captures a provisional sense of the possibilities for attaining new kinds of conscious being, exclusively or essentially, through the telematic channels provided to us by computerized calculations, communications, codes. Subjectivity typically denotes the qualities possessed by a conscious being with significant individuality, agency, personality; however, how are these factors become rearticulated through cybernetic systems? Negroponte's enthusiasm in his Wired writings for all the technical possibilities for being digital prevents him from posing more interesting questions about digital being. Save for his overdrawn exhaltations--which were first noticed fifteen years ago by the Tofflers in The Third Wave--over the shift from "atoms" to "bits" as the wave of the future, he too sticks with the usual interpretive conceit is that these new (wo)man/machine interfaces will simply reposition existing material styles of social agency and structure in a new cybernetic register, making everything more or less the same there as it is here, only maybe

more so, meaning essentially quicker, better, closer, sharper, etc (Toffler and Toffler, 1980; Lucky, 1989).

Most things will be as they are now in synchronous, material co-location, only they will happen on-line as we realize our net connections are simply creating a digital planet, new digital neighborhoods, a digital culture, flexible digital communities. These assumptions about cybernetic subjectivity, however, are questionable. It is not clear from the current computer interface of (wo)man/machine that digital being is the same, only more so, as material being in terms of personal agency/social community/cultural dynamics. Ontologically, things are getting extremely different, and quite rapidly.

VIII. Digital Beings Enter RL

Inasmuch as cyberspatialization represents the displacement of human being into digital zones of telemetricity where bits mediate agency and structure, one must consider how the political economies of cyberspace might morph human beings into digital beings. Third nature brings with it new biota and fresh forms of being, usually called "artificial life" by the cybertheorists, unseen on the terrains of first and second nature. The body as an organic site for defining subjectivity now can become contested in cyberspace as its substance and presence is digitized. Indeed, one also can anticipate an entirely new political economy emerging; one rooted in the production, circulation, consumption, reproduction of digital beings as

cyberspace turns into a fully social project. The forms of these digital beings are still indistinct, but at least three definite varieties might be described here.

Preconfigurations of digital being perhaps existed already when and where any system of disciplined governmentality sought to construct its own system of subjectivity from the inscriptions of power/knowledge codes on large assemblies of individual human beings. In such settings, one might witness the evolution of digital being in the shape of statistical populations (large pools of data) and statistical persons (individual data packets) of various magnitudes and dimensions (Burchell, Gordon and Miller, 1991: 87-104). As subjectivities that can be made, as well as be seen as forming from the divergent processes of their discursive manufacture, these digital beings are fabricated within disciplinary force-fields in order to be managed as consumers, citizens or clients by the bureaucratic apparatuses. These become that fused, or perhaps it is (con)fused, with them in (wo)man/machine interactions (Weiss, 1988). Thus, voters are imagined as machinic bundles of stable pre-formed preferences inclined to make choices in predictable transitive rational decisions; one only must find their "hot buttons," and then push them in the political campaigning enterprise to get sufficient numbers of these digital beings to decide definitively on election day to favor or disfavor arrays of choices with a vote. Their lived reality for party campaigners is not a collective

flesh-and-blood existence; it is instead merely a digital decision domain full of statistical persons with this or that intense propensity to pull or not pull the voting lever with favor and disfavor (Hart, 1994; Herbst, 1993).

As Foucault suggests, these digital beings are embedded life forms, created by and for disciplinary institutions that generate power over and knowledge of them by meshing groups of people in vectors of influence riven through complex statistical spaces. Such digital beings have only indirect capabilities to control their identity and agency as subjects, because they tend to be captured inside of dedicated institutional domains built for exercising action at a distance to serve government bureaucracies, partisan organizations or corporate enterprises (Seltzer, 1992: 1-21). Perhaps these digital beings really are more "plant-like" in such manifestations, surviving as strange creatures inside the specialized, immobile, and fixed environments of pooled data ecologies or focus group streams. In many ways, statistical persons are analog agencies set into motion by technics of/for motorization, and their statistical surveillance by large formal organizations simply tries to model how and why they move as well as manipulate where and when they attain motion (Rabinbach, 1990: 84-145).

The digital being that the technics of computerization elicit, on the other hand, may be much more "animal-like." Digitalization transmogrifies simple analog agents into more

complex beings with possibilities for motion, location, activity, and understanding beyond those contained by ordinary material culture. RL currents of thinking fixate upon naive notions of Nature, or the embodied practices of wetware (organic human beings), in an ordinary everyday life understanding of some human being's natural existence. Here, precybernetic categories of metaphysics and physics parcel up the world in conventional bundles of Nature/Culture, Humanity/Technology, History/Society, Being/Time as common sense or tradition have framed them. In them, hardware (computers or telecom networks) and software (code constructs or packaged routines) are nothing more than inanimate objects, or technology, that people, or humanity, use as tools. Inquiries into cybernetic subjectivity must challenge the physiocentrism of contemporary human beings, inviting an openness to other realms of dimensionality/temporality/activity that may be unfolding in hyperrealities beyond the spaces of RL (Latour, 1992).

To consider other possibilities for cybernetic subjectivity in cyberspace, one must reexamine various becomings that are being thrown from the digital revolution as fresh occurrences in our being and time. Foucault's vision of modern subjectivity being in part an artifact of large complex institutions creating particular types of individual agents to accommodate their operations is relevant here. Perhaps the complexities of interfacing with complex computational and telecommunications

networks are providing new posts for the construction of subjective agents as digital forms of being that the dynamics of the (wo)man/machine interface define. It is a rough measure, but at least three new paths taken by human beings toward becoming digital lead into three different, but distinctly interrelated, forms of digital being. As one listens to cyberspatial theorists, the possibilities of digital being are conjured before us with considerable regularity (Gilder, 1992; and, Rushkoff, 1994). Yet, their meanings, implications, or consequences are fairly unclear.

A. Digital Being: First Form

First, and still foremost in many discussions, digital being emerges out of actual human beings, which might be our degree zero form of being here, experiencing the new cybernetic agency of becoming computer users, working on and off line with complex computational and telecommunication networks. The fusion, or (con)-fusion, of (wo)man/machine in computer applications creates many new positionalizations of subjectivity--as hardware-based, or is it perhaps "hardworn," calculator, reader, viewer, writer, composer, designer, communicator as well as software-driven, or maybe it is "softworn," worker, voter, debater, inventor, observer--to consider only a few. Without desktop video to visualize the actual operator's physical body, this form of digital being now permits anyone to assume their own virtual personae, hyperembodiments, and agencies in various telematic

contexts as either bursts of pure electronic writing or displays of playful graphical ideoglyphs.

The telecommuter, the lurker, the hacker, the web surfer, the newbie, the flamer, the sysop, or the hot chatterer all constitute new posts for people to represent (or misrepresent) themselves and others as cybersubjects. These positionalizations of individual agency are more than minor variants of conventional tool usage; they provide new social roles to invent and/or evade a dramaturgy of collective cultural activity as telepresences or as cyberagents (Reingold, 1993: 145-196). The bandwidth constraining most network communications now more or less dictates that such digital beings represent themselves and deal with others through a textual interface. While some symbolic refunctioning of keyword orthography exists, digital beings exist on-line through point-to-point, many-to-many exchanges of spare prose that rarely fills one entire VDT screen. Graphics, scanned photos, voice, and desktop video can change this sociology of digital being, but most interactions still occur within bursts of electronic writing. These mediations of one's identity as a digital being, in turn, delimit how such telepresence or hyperembodiement is experienced as a meaningful variety of personal existence.

In these contexts, this kind of digital being in cyberspatial political economy veers back and forth between states of existence defined either by serious work roles or

fantastic play roles. Highly mobile, symbolic-analyst workers, for example, envision telecommuting, usually in slick telecom or modem advertisements, as liberation from office politics, bureaucratic drudgery, or fixed careers, because their laptops and modems link them into their physical workplaces as they perform new types of free, self-guided, pleasant labor at the beach or in the mountains. Digital being here is a liberated subjectivity able to go anywhere anytime anyway and still stay in productive, efficient work relations. Telecommuting, however, also can assume the more common form of off-shore, low-wage sweatshops where female data-entry or wordprocessing specialists move raw data or text by the keystroke through satellite switches to major corporations in Los Angeles, London, or Lyon. On the other hand, cybersexual subjectivity can be thoroughly fantastic and playful. Because physical bodies often do not appear in the interface, digital sexual beings can choose to be male, female, young, old, heterosexual, homosexual, transsexual, etc. even if they are not. Virtual identity varies widely in cybersex, allowing anyone to do anything anytime anyway with anyone or anything.

In either of these work or play contexts, telecommuting or cybersex can be linked back into real time and space, but the actual identity of the material being actually acting is can be anonymous, disguised, or fictional. Digital being, then, allows one to invent varying identities for work or play that can be

adapted to different real or hyperreal contexts. Work contracts solicited over the Internet may be won by bidders who disguise their age/gender/race in virtual identities to compete more openly with bigger, different, richer competitors; sexual liaisons may occur between two digital beings--perhaps, for example, one male, one female--invented maybe, on the one hand, by a duo of bored junior female bankers and, on the other hand, a group of male transvestites who simply enjoy playing vicariously the virtual parlor games of these kinds of digital beings. The liberating possibilities of these activities, however, cut more than one way. As the current controversy over cyberporn on the Internet indicates, digital being can be the mediation of dark violent urges from the nonvirtual world. Whether cyberporn is accessed by children, pedophiles find young victims in some BBS chat session, or murder is plotted in snuff stories for an adult MUD, cybersex is not necessarily just play.

This digital being as one positionalization of cybersubjectivity is becoming more interesting morally, politically, or socially. So many real ethical moves presume face-to-face contact, or materially embodied synchronous collocation, like politics or sex. Yet, digital beings can create cybersubjective interactions that apparently satisfy their initiators in screen-to-screen noncontact or virtually disembodied asynchronous dis-location. Libertarians assert we should be free to do anything in our own private sphere as long

as it does not harm others; yet, digital subjects may or may not inhabit personal spheres that conform to such ordinary notions of privacy. Likewise, in these realms of digital being, what is harmed and how is it harmed? In virtual reality, what new legal, political, cultural rules should guide hyperreal behavior? Might not digital beings of this sort be encouraged, for example, to press for teledemocracy in cybernetic referenda? Would voters approach it somewhat seriously, like real embodied civic voting, or mostly as play, like hyperreal on-line cybersex? Should digital beings, on the one hand, who simply indulge in imagining or, on the other hand, actually get engaged in performing acts of murder, rape, torture, dismemberment to other digital beings in some kinky MUD be sanctioned somehow for their digital acts of sociopathological being? Would only new digital laws pertain here or would old laws need to be mapped over? And, then who would promulgate and enforce them? Telepresence is and is not like a material presence, but might not digital beings expect similar categorical imperatives to operate in cyberspace? Maybe the moralities of material being often will fit poorly the expectations of digital being in hyperreality.

B. Digital Being: Second Form

Second, and less prominent in most discussions, a another variety of digital being emerges out of software assemblies as computer designers push for intelligent agency by designing new personal services into hardware and code structures. In other

words, programming design has advanced quite significantly as new bioemulations or artificial lifeforms are being created to coevolve with people. This sort of digital being has evolved with great rapidity and diversity alongside computer machineries and networks. Looking at real computer systems, for example, one finds thousands of artificially generated organisms, like computer viruses, worms, or bacteria, which essentially are digital parasites, living off the resources provided by computer hardware. Whether it is a diskette, a hard disk, a mainframe CPU, or network server, these digital beings typically are self-reproducing pests, whose life-forms depend upon the cyberenvironments of real computers. At the same time, artificial life designers create "virtual computers" within real computers, as a type of bioisolation lab, to generate new virtual organisms that should occupy only the virtual environments emulated by these isolation chambers. Here digital being takes many forms as cellular automata, pattern machines, game artifacts, or genetic algorithms; their vitalistic properties, in turn, can be controlled to prevent them from becoming viral parasites in real computer systems (Kelly, 1994: 166-183; Emmeche, 1994: 39-42, 114-117).

Such digital beings are only being made out of computer code, but increasingly they have many conventional accepted signs of life--intelligence, sentience, agency, prudence, creativity. What are these digital beings that now are beginning to inhabit

and thrive purely in cyberspaces? The fusion, or (con)fusion, of labor/machine in software packages creates post-zoological agents with many new positionalizations of subjectivity--as receptionist, mail sorter, batman, personal assistant, chamberlain, travel planner, executive secretary as well as research assistant, data analyst, pattern detector, symbolic analyst, communications operator, calendar keeper, life master. Already a few crude intelligent agent systems, like "Bob" or "Wildfire," occupy cyberspatial niches for their owners/users performing all or some of these tasks. As these packages become individually customized by their users in particular cultural/familial/historical practice as well as more sapient in their intelligence or liberated in their agency, one must ask what these digital beings are qua beings in our time? Are they purely dead functional appliances or does their intelligent agency make them somehow alive?

Such personal digital assistants (PDAs) are maybe much more than a gizmo, like Apple's Newton, but maybe much less than a zoological lifeform, like a seeing-eye dog. As they evolve, they could indeed become a very vital presence in many of our lives. In fact, as digital recorders with total omniscience, they can be the definitive chroniclers/recorders/masters of our life inasmuch as their digital being mediates between us and other digital beings as well as between us and other living human and nonhuman beings. How will these digital beings be created, who will

introduce them into our existence, what protections will they have, which ones will be empowered to do what for ends, and when will they be terminated? Particularly when one intelligent agent is directed to meet with and negotiate with another's intelligent agent with moral and legal force in some sense as envoys/mediators/dealmakers/decisiontakers, how will their being be regarded: 1) as extensions of their owners, like servants, slaves or animals; 2) as purely private property of their owners, like slaves or animals; 3) as subjects of employment by their owners, like bondsmen, or apprentices; 4) or, as in-house chattel of computer networks, like voicemail systems or menu routines in software packages? Are they virtual representatives with some modicum of their own preauthorized discretion, actual representatives carrying only our direct brief, or physical representatives simply tracing telepresences from otherwise remotely positioned human beings acting from somewhere else? Empowered to protect and serve their users/owners in cyberspace, these intelligent agents in such forms of historicized being may be forced to give witness, endanger information, disclose secrets, reveal decisions, or provide access against their instructions? What rules would hold then: are they truly conversant intelligent agents with some sort of legal protections? If so, then what sort rights might be extended to them and why? Or are they essentially dumb dead boxes available for inspection at any time by anyone?

Musing about such cybernetic subjects may seem silly, because, after all, the intelligent agents being generated by computational biology can only be slaves to or servants of their masters (Emmeche, 1994: 156-166). Yet, is this entirely fair? Some cybernetic visionaries oddly foresee a human life beyond the body. And here they are not talking about some future biomechanical resurrection of a human being's zoological wetware from a cryogenic deep freeze. Instead, as Hans Moravec (1988) at Carnegie-Mellon University dreams, why not transfer all of a living human being's memories, intelligence, agency, knowledge, experience as sophisticated computer code on to chips or into software, bringing now perhaps even the living person's actual voice on a sound chip. Therefore, what if a living human being becomes another kind of PDA--a personified digital agency, a postbionic demonic avatar, or a previously-embodied digital angel? What would these humanoid digital beings be: merely bizarre simulacra of once zoological forms or truly intelligent human agencies? Brain death in the body could be sublated by brain life on the net, creating unbelievable dilemmas betwixt and between postzoological notions of life and death, agency and property, identity and power, being and time.

While living beings cannot now migrate from carbon-based to silicon-based bodies, a kind of Jurassic Park-like resurrection of the once dead from the still crypts of an analog grave occurs everyday as morphing magic pulls bits of code from the amber

suspension of old celluloid film stock, plastic LP records or oxide audio tape. Mixed in morphing programs, simulated by sampling routines, colorized from chromatic computations, the crisp images of real bodies or rich echoes of actual voices long ago lost to real-time analog death return in Coca Cola commercials or Forest Gump-eries as golems ground together out of gigabytes of digital dust. Now smart movies can cast living-dead digital actors in new supporting roles speaking in sampled voices and moving within morphed bodies alongside real actors. Smart recording studios can record music allowing us all to listen to Hanks Williams, Sr. and Hank Williams, Jr. sing a new kind of digital ballad just like Nat King Cole and Natalie Cole or John Lennon with the still living Beatles have all sung in real-time from cyberspace in hyperreal arrangements.

C. Digital Being: Third Form

These bizarre, but nonetheless real, possibilities return us to our taxonomy of digital being. Third, and least prominent in many discussions, another kind of digital being is developing within smart machines as engineers attempt to androidize hitherto dumb/mute machines, transforming them into smart/talking digital beings. In this third form of digital being, computerized applications of intelligent agency are being substantively integrated into cybernetic and noncybernetic technical objects, giving many such artifacts most of the key classical traits of human life--consciousness, intelligence, personality, memory,

speech, agency or experience (Negroponte, 1995: 206-218). The fusion, or (con)fusion, of living being/dead machine in a fabricated artifact generates another sort of parabionic agent with many new significant positionalizations of subjectivity--as talking car, smart house, electronic wallet, knobotic terminal, autopiloting boat, prudent drone, brilliant munition, aware apartment, surveillant store, intelligent toilet (Kelly, 1994: 166-202).

Increasingly, one finds hitherto dumb mechanisms, which were once totally controlled by direct human manipulations of mechanical control surfaces built into machineries as manually-activated interfaces--like steering wheels, keyboards, push buttons, or handles--being given the powers of voice and/or speech recognition. Digital control plus digital speech synthesis and voice recognition are animating once dumb objects, permitted them to be voice-activated varieties of smart subjects.

Unable to speak to first nature, human beings are combining elements from second and third nature into a new kind of digital being with embodied/material/active/intelligent capabilities, including the powers of problem-solving or the facility of voice.

Thus, entire new species of these digital beings can coevolve with human beings in quasi-objective/quasi-subjective networks, which essentially are the basic formative ecologies for an android subjectivity.

Such beings are neither Star Trek: Next Gen's Data nor even

Star War's C3PO with their Hollywood-styled forms of highly anthropomorphic digital being. Instead they are more like The Starship Enterprise itself in old Star Trek Classic episodes in which the space vehicle itself with all of its on-board computer systems, human and nonhuman life supports, and sensing arrays was an intelligent digital being with distributed intelligence constructed into its own machinic structure. With enough conscious agency for its own baseline guidance, and a conversant consciousness with basic analytical problem solving powers all engineered into its own cybernetic systems, the Enterprise represents how complex a voice-activated tool can be. Such forms of digital being are beginning to coevolve as unique new species of beings with all of the humans attempting to androidize their tools. The closest approximation to this kind of intelligent technology today undoubtedly can be found in the decentralized, adaptative, flexible, collaborative, distributed, and expert systems in the network of networks composing the Internet structure.

This form of digital being is not science fiction; precursors already exist in concrete prefigurations as intelligent materials, smart weapons, voice activated mechanisms, expert systems, or robotic complexes. Even without contact with human cybernetic subjectivity of the first type, these beings would have qualities of digital life with their strong emulations of consciousness, sentience, prudence, agency or personality in

each of their cybermechanical structures (De Landa, 1991: 179-231). And, once they exist in greater numbers more widely, we must consider all of the implications of coexisting with such digital beings. When genetic algorithms are coupled with robotic factories to turn out new generations of conversant computers, intelligent materials, or expert tools, then a truly new phylum of digital beings might well begin evolving separate and apart from any direct human intervention.

Stealth warplanes, because of their intrinsically anti-aerodynamic designs, already must fly themselves "by wire" apart from their pilot's manipulations, to maintain any inherent stability and lift, and their designers are testing whole new associated families of brilliant munitions that will decide on their own when, what, who, why, and how to destroy as their opposition without much, or any, direct human control. Once brilliant weapons move beyond the ordinary smartness of "fire and forget" to an extraordinary brilliance in "find, figure, fix, finalize, fire, and forget," then civilian spin-offs will follow.

Brilliant automobiles and smart houses soon too will begin to do everything they are told on their own initiative once empowered to act by their owners. The technological assumptions built into autonomous weapons systems, like PROWLER (Programmable Robot Observer with Logical Enemy Response) or Brilliant Pebbles (a Star Wars ABM system), plainly may make other forms of autonomous artifacts, expert systems, or smart devices far more common

inhabitants of our existing social spaces (De Landa, 1991: 160-178).

These distinctions thusfar are, for the most part, analytical. As the evolution of different digital beings becomes more prevalent throughout many sectors of society, it is increasingly apparent that the second and third forms of digital being are special derivations devised to cope with the shortcomings and downsides of the existing interface of (wo)man/machine for the first type of digital being. Being telepresent has its costs, including an open acceptance of other telepresent interactions that makes a cybernetic receptionist almost essential. More and more digital socialization by human beings as a digital impersonation invites a further and further elaboration of new digital networks of interaction, which, in turn, necessitate the creation of the second form of digital being to handle the traffic of the first form's digital existence. Intelligent agents evolve to cope with the human challenges of becoming and remaining a digital being; otherwise, much too much time is to be lost simply in sorting through the transmissions and returning them in kind as a first form of digital being.

The basic "user unfriendliness" of the keyboard interface, even when its workings are massaged by the ministrations of an intelligent agent, invites further innovations in the domain of (wo)man/machine interfaces. Third form digital beings that can

be talked to, or ordered about, as part of normal patterns of ordinary speech create new types of humanity/technics interactivity by transcending crude, slow alphanumeric strings of electronic writing via QWERTY keyboards as the human being's mediations of his/her telepresence or cybersubstance. Turning hitherto mute and dumb objects into beings with native voice and intrinsic intelligence totally transforms the quality of digital being. All three forms certainly will evolve together as an existential ensemble of diverse repositionals of personal agency and social structure; and, at the same time, the second form enhances the operations of the first form just as the third form elaborates possibilities in the second and first forms by settling permanent cyberagencies of intelligence, memory, experience, and perceptiveness into the material shape of software systems and hardware formations (Levy, 1992; and, Mazlish, 1993).

All of these digital beings are hybrids of human and nonhuman, subject and object, (wo)man and machine, consciousness and corporeality in a new cybernetic register.²¹ Without the software/hardware/network ensembles actually enabling the forms of digital being projected by telecommuting or cybersex, this sort of cybersubjective position could not be taken. Without routinized task-serving codes or network links, the digital being of intelligent agents would have no environment to adapt itself as a new kind of existence in our forms of cybernetic

subjectivity. And, without the command/control/communication packages being embedded into industrial artifacts to empower them with consciousness, voice and memory, the digital being of smart artifacts would have no agency to evince. Whether they are hybrids or not, these digital beings all are coexisting with us in our being and time, and our subjectivity is being enhanced and constrained by the qualities of many of our interactions with them. Essentially, digital beings invite us again to amend the ontological constitution we uphold with its various traditional articles for defining how human and nonhuman, agent and structure, subject and object might confederate in our Nature/Culture contracts (Latour, 1992: 136-145).

Once all of these digital beings are seen as existing per se, how will they be treated as beings? What legal status, political identity, economic agency, cultural structure, theological meaning will they have? They might represent monstrous beings living on the margins, surviving at the edge, adapting to the infrastructures inside and outside of material and virtual reality. With digital gills and analog lungs, virtual fins and material legs, these amphibious agencies now are rapidly coevolving with humanity. New questions, however, arise with coevolution (Stock, 1993). Will they reproduce as separate species? Or will even more fascinating hybrids emerge as telepresent human beings (first form) couple with smart space probes (third form) to explore extraterrestrial sites? Will

material human beings nearing biological death (zero form) clone their personalities into software intelligent agents (second form) to take a hardline against real people virtually in the material world? Or will they, as Moravec's software immortals (second form), really migrate into a smart house, talking car, or intelligent material (third form) to find new historical embodiments? Even more problematically, will any of these digital lifeforms clone themselves, combine with viruses, or commingle as code to create virtual reproductive lineages of an artificial life in a purely postbionic zoology?

IX. Infotectures for VL: A Conclusion

Virtual realities, as envisioned and implemented by informatic systems, are new realms of space--or a third nature--generated by digital computation and communication in flows of numerical data encrypted to represent video images, spoken language, musical performances, textual script, graphic displays or hardware instructions. Still, these domains of space even now rarely are apprehended in spatial terms as old registers of semiotics, cybernetics, or even electronics still are used to interpret the so-called "man/machine" nexus of informatic activity. Software and networks do more than structure and present information; they also generate and sustain spaces, or hyperreal estates, which need to be rethought and reenacted as spatial domains with their own unique properties of accessibility/inaccessibility, boundedness/unboundedness,

underdevelopment/overdevelopment, security/insecurity, publicity/privacy, openness/enclosure or commodification/collectivization for the cybersubjectivities now beginning to inhabit them in groupware, thoughtware, mediaware formations as digital beings.

Ordinary language now speaks in terms of computer environments, office environments, telecommunications environments, software environments, etc. These metaphorical allusions disclose real shifts in how people/systems interface/interact/interrelate, because "environments" are, following the Old French origins of the term, surrounded, encircled, beleaguered space. Multi-media suggest that there are multiple mediations for producing and policing of such space. Who surrounds, encircles, beleaguers what, whom, when, why and how is a political question, moving far beyond naive appraisals of multimedia as mere machine performances or computing environments in simple systems applications. These informatic environmental sites are points of contestation where informational discourses seek to generate the identities or discipline behaviors of digital beings by stipulating what operating systems do, how software performs, why machines network, when database access occurs. Design--its styling, assumptions, rhetoric, goals--expresses all of these tendencies in code by inventing new textual displays and graphic packages for interface design. Thusfar, it has not been done artfully.

Software and hardware ensembles need to be reappraised not as inert combinations of machine instructions and instructed machines but rather as genetic operations, creating artificial environments for new social formations and digital beings out of their interactivities. Call these entities anything: siteware, spaceframes, servware, networks, mediaware, infostructures. Morphing the metaphors of world-disclosure gives one access to new observables hitherto occluded by old categories for disclosing the man/machine interface. Siteware needs site design, spaceframes require spaceframe making, servware demands systemic service, networks need networkers, mediaware necessitates mediation constructs, infostructures call for informational structural engineering. All of these shifts point toward a new set of practices, or perhaps an "infotecture," and new roles, or maybe cadres of "infotects," for serving the lifeworlds of cybersubjectivity.

Virtual reality and all of its hyperreal estates in VL pose tremendous new opportunities for design. Cyberspace is filling with infostructures, but these edifices are typically shoddy vernacular improvisations cobbled together by computer makers and network engineers with little or no sense of design. Almost all existing infostructures are fairly inaccessible and frequently inoperable to ordinary users. Infotecture must address these problems, because until operational access and ease of daily use equal those of telephones, for example, the digital being of

advanced informatics will be highly constrained. Virtual spaces can be designed to be user-friendly, self-correcting, object-oriented, and platform-flexible for fully accessible and completely transparent interactions. Infotects must design new norms of legibility, practices of simplicity, and structures of accessibility for digital beings in infostructures that escape the current poor standards of informatic engineering.

Infotectures require inhabitants--digital beings will occupy cities of bits. Cyberspaces will be occupied by virtual impersonations of their users and/or avatars of machine functions; hence, informatic design needs to envision an evolution of cyborg life forms beyond today's simple artificial life, like computer viruses. In such cyberspaces, what will shape the digital being and time of such cyberpresence? How realistic or hyperrealistic will the im-personations of specific human subjects become? Such avatars of agency could simulate their users in either humanoid or nonhumanoid forms. Design must test the aesthetics and/or semantics of representing individual persons as well as groups of such persons. How subjectivity will be simulated becomes a design challenge; once infotectures are accepted as domains of hyperreal estate, then will not their occupants need to be invented as hyperreal estate owners and operators with immediately recognizable behaviors, identities, and capacities? Are they repositionalizations of real agents in hyperreal spaces, reinventions of subjectivity for cyberspace, or recreations of

life in another dimension that gives their encoder's theogenic powers? Whether such virtual built environments will feature other fauna or flora to coexist in particular cyberecological niches raises additional design issues. Infotects surpass architects by designing their clients and client societies as well as their client's built environments; indeed, infotecture becomes a kind of bioengineering in/for/of cyberbiota and cyberbiomes.

What exists for human beings is disclosed by words. Familiar words open only old worlds, but unfamiliar words might unlock new worlds that have yet to be clearly disclosed. Consequently, existing terms will gain new meanings, and now nonexistent worlds will be discerned by bringing new language into common currency. To comprehend the political economy of cyberspace, its worlds of cyberspatial hyperreality, or the realms of third nature, call for hyperreal words to capture the virtuality of the anamorphically real structures and functions unfolding there inside its telemetricalities.

Design often is ignored in everyday life, but it has a power beyond and beneath legislation. To the extent that we live in manufactured, planned or managed built environments of any kind in second nature, design has a political function. It determines who get what, where, when and how. Inasmuch as design decisions--rooted in financial constraints, aesthetic norms, technical requirements or personal styles--choose to make X move rather

than Y gesture under Z conditions, designers acquire power over others through their design of acts and artifacts. Because this disciplinary capability plays itself out anonymously through the tastes, feels, smells, looks or sounds of product design, it frequently is neglected. Still, designers are empowered operationally as professional-technical experts to express a truly legitimate form of authority as legislators of taste, judges of performance or executors of style.

To the degree that our culture is coded by conventional understandings made manifest in acts and artifacts, design also assumes responsibilities in reengineering or, as Disney would have it, "imagineering" the semantic style or conceptual code underpinning our personal and social understandings of any acts and all artifacts. These responsibilities are truly extensive in the realm of material culture under industrial conditions of production in second nature where meanings are embedded within or assigned to mechanically reproduced material products. However, designers must consider how these responsibilities might intensify under informational conditions of production in third nature where the production, circulation, consumption, and accumulation of information as video, audio, text, data or image are becoming the key nexus of value-adding labor. As value-adding circuits shift from less material to more immaterial sites of labor, what role might informatic design assume in refining the conventional understandings used to make acts and artifacts

in the political economies of cyberspace more attractive, meaningful or efficient?

This discussion has considered provisionally the politics of cyberspatial environments. Instead of adhering to metaphors that disclose cyberspace as echoes of office equipment or home entertainment environments in which designers must smooth out the rough edges in the industrial-era's "man/machine interfaces," digital being forces us to cast multimedia environments as domains of cyberspace, regions of hyperreal estate, or planes of virtualized reality where new types of social interaction are unfolding. The politically incorrect man-and-machine conceptual linkage mystifies everything about how computer hardware/software ("machine" and "code") reposition computing wetware ("man" or "woman") in new subject/object relationalities. New information infrastructures, are being built out of fiberoptic, wired or wireless networks, but they also generate new fields of cultural spatiality and social interactivity in communicative computing networks, which must be reimagined as immaterial infostructures, imagineered sites, or improbable cyberspaces for digital beings.

The design aesthetics of informatic encounters, however, still are trapped within old communicative categories and outmoded representational rhetorics. When everything is said and done, the state of the art is generally artless. E-mail is little more than an animated telegram, most Web sites are sad assemblies of photo slide shows reminiscent of family snaps from

a summer trip to Atlantic City, on-line services get by with crude menu screens that rarely equal the sophistication of crude computer animation, many CD-ROM packages badly mix the textual formats of children's encyclopedias and visual styles of music videos, and computer games are lousy non-perspectival renderings of kung fu movies in low-definition pixels. On the cutting edge of multimedia design, designers pretend that reformatting an on-line service as an animated cartoon representation of a little village or casting an intelligent agent as a helpful cybernerd drawn like a comic book character is innovative design practice.

Truly radical informatic design must surpass these rear-view mirrorings of new media experiences in categories ineptly borrowed from cinematic entertainment logics first elaborated over a century ago. Instead of approaching cyberspace as space where people interact socially, it continually is reduced to little more than an electronic emulations of objects which are manipulated technologies, (pinball machine, mail box filing cabinet, telephone, typewriter, calculator, fax machine, overhead projector, etc.) manufactured to fit into industrial design rhetorics. The full potential of digital networks cannot be fully exploited until their powers to generate virtual spaces inhabited by digital beings with diverse cybersubjectivities are fully recognized. Another dimension of/for creation flows in and out of third nature, making it theoretically possible to simulate hyperrealistically many individual behaviors, social

institutions, cultural practices or material structures in cyberspatial forms--if designers can conjure convincing visual, audio or tactile mediations for them as positionalizations of digital being.

The political economy of cyberspace arises from informatic technologies, which are virtualizing many forms of social interaction. Consequently, activities between real people that now instantiate cultural practices or express economic structures as social institutions in the real time and actual space of RL are to be replaced by informatic emulations of people in the hyperreal time and virtual space of VL. Most networking software now available, however, is designed in ways that distort/deform/disrupt/delay such virtual interactivity, raising the question of whether or not such informatic systems misplace rather displace human relationships as informationalization overrides synchronous face-to-face activities with asynchronous and/or screen-to-screen links.

Webworking already speaks in terms of sites; to take this shift in speech literally, cyberspatial design needs to be reinvented as infostructures/infocultures/infotectures/infocommunities in both textual and graphical terms. On informatic mediascapes, entirely new built environments can be constructed, but only if imaginative design first envisions them as digital places and spaces. And, once these moves are made, designers also must

create the mediations of digital being--avatars of human agency as infopresences or complete codes for virtual im-personation. Cyberdesign will invent the forms of not only cybercities, but also of their cybercitizens and cybercommunities. Many different subjectivities, scores of varied personalities, and multiple social skills must be coded into such cybermediations as emulations of "persons." Cybersubjective design, then, should compound power, vision and taste into digital beings for cyberobjective infostructures to shape third nature more artfully.

Informatics displace actions and beliefs from material reality in RL into the VL of cyberspaces, but actions and beliefs will not play out the same way in these new domains. Designers must confront the politics of digital being directly and immediately in the simulated sovereignty of what is now naively called "interface design." Are cyberspaces designed to replace reality-constructs with virtuality-constructs, limiting access to and use of their resources only to the few? Are actual human interactions in personal, family or civic contexts to become as virtualized as many work and educational interactions already are now by means of informatic telecommuting, cyberschooling or telepresencing? Should designers create infostructures that only complement real structures or supplement actual agencies instead of working at informatically replacing them entirely? Power works insidiously enough now in ordinary institutional discipline

and expert discourse: how might it work as these practices are hyperrealized in cyberspatial structures and practices?

Informatic societies must evaluate all of these questions in reinventing the rhetorics of the representation of new subjectivities for digital being in the telematic territories of cyberspace.

References Cited

- Agnew, J. 1987. Place and Politics: The Geographical Mediation of State and Society. Boston: Allen and Unwin.
- Anderson, B. 1991. Imagined Communities, rev. ed. London: Verso.
- Attali, J. 1991. Millenium: Winners and Losers in The Coming World Order. New York: Random House.
- Blackburn, R. James. 1990. The Vampire of Reason: An Essay in the Philosophy of History. London: Verso.
- Brand, Stewart. 1987. The Media Lab: Inventing the Future at MIT. New York: Viking.
- Burchell, Graham, Colin Gordon, and Peter Miller, eds. 1991. The Foucault Effect: Studies in Governmentality. Chicago: University of Chicago Press.
- Castells, M. 1989. The Informational City: Information Technology, Economic Restructuring, and the Urban-Regional Process. Oxford: Blackwell.
- Corbridge, S., Martin, R., and Thrift, N. 1994. Money, Power and Space. Oxford: Blackwell.
- De Landa, Manuel. 1991. War in the Age of Intelligent Machines. New York: Zone Books.
- .Der Derian, J. 1990. "The (S)pace of International Relations: Simulation, Surveillance, and Speed," International Studies Quarterly, 34 (September), 295-310.
- Emmeche, Claus. 1994. The Garden in the Machine: The Emerging Science of Artificial Life. Princeton: Princeton University Press.
- Fortune, "Quarterly Report on Information Technology," May 15, 1995.
- Foucault, M. 1991. The Foucault Effect: Studies in Governmentality eds. Graham Burchell, Colin Gordon and Peter Miller. Chicago: University of Chicago Press.
- Gibson, William. 1984. Neuromancer. New York: Ace Books.
- Gilder, George. 1992. After Television. New York: Norton.

- Hart, Roderick P. 1994. Seducing America: How Television Charms the Modern Voter. New York: Oxford University Press.
- Harvey, D. 1989. The Condition of Postmodernity. Oxford, Blackwell.
- Henderson, J. and Castells, M. 1987. Global Restructuring and Territorial Development. Newbury Park, CA: Sage.
- Herbst, Susan. 1993. Numbered Voices: How Opinion Rolling Has Shaped American Politics. Chicago: University of Chicago Press.
- Jameson, F. 1991. Postmodernism, or the Cultural Logic of Late Capitalism. Durham: Duke University Press.
- Kelly, Kevin. 1994. Out of Control: The Rise of Neo-Biological Civilization. Reading, MA: Addison-Wesley.
- Latour, Bruno. 1993. We Have Never Been Modern. London: Harvester Wheatsleaf.
- Levy, Stephen. 1992. Artificial Life. New York: Pantheon.
- Lucky, Robert W. 1989. Silicon Dreams: Information, Man and Machine. New York: St. Martin's.
- Luke, T. W. 1994. "Placing Powers/Siting Spaces: The Politics of Global and Local in the New World Order," Environment and Planning D: Society and Space, 12 (1994), 613-628.
- Luke, T. W. 1993. "Discourses of Disintegration, Texts of Transformation: Re-Reading Realism," Alternatives, 18 (3) pp 229-258.
- Luke, T. W. 1989. Screens of Power: Ideology, Domination, and Resistance in Informational Society. Urbana, University of Illinois Press.
- Lyotard, J. F. 1984. The Postmodern Condition. Minneapolis: University of Minnesota Press.
- Mazlish, Bruce. 1993. The Fourth Discontinuity: The Co-Evolution of Humans and Machines. New Haven: Yale University Press.
- Mitchell, William J. 1995. City of Bits: Space, Place and the Infobahn. Cambridge, MA: MIT Press.

- Moravec, Hans. 1988. Mind Children. Cambridge, MA: Harvard University Press.
- Negroponte, Nicholas. 1995. Being Digital. New York: Knopf.
- O'Brien, R. 1992. Global Financial Integration: The End of Geography. New York: Council on Foreign Relations Press.
- Onuf, N. 1989. World of Our Making: Rules and Rule in Social Theory and International Relations. Columbia, SC: University of South Carolina Press.
- Poggi, G. 1978. The Development of the Modern State: A Sociology Introduction. Stanford, CA: Stanford University Press.
- Rabinbach, Anson. 1990. The Human Motor: Energy, Fatigue, and the Origins of Modernity. New York: Basic.
- Reich, R. B. 1991. The Work of Nations: Preparing Ourselves for 21st-Century Capitalism. New York: Knopf.
- Reingold, Howard. 1993. The Virtual Community: Homesteading on the Electric Frontier. Reading, MA: Addison-Welsey.
- Rushkoff, Douglas. 1994. Cyberia: Life in the Trenches of Hyperspace. San Francisco: Harper.
- Seltzer, Mark. 1992. Bodies and Machines. New York: Routledge.
- Slouka, Mark. 1995. War of the Worlds: Cyberspace and the High-Tech Assault on Reality. New York: Basic.
- Smith, N. 1984. Uneven Development. Oxford: Blackwell.
- Soja, E. 1989. Postmodern Geographies. London: Verso.
- Stock, Gregory. 1993. Metaman: The Merging of Humans and Machines into a Global Superorganism. New York: Simon & Schuster.
- Taylor, M. and Thrift, N. 1986. Multinationals and the Restructuring of the World Economy. London: Crown Helm.
- Time. 1995. "Welcome to Cyberspace: Special Issue," 145, No. 12 (Spring).
- Toffler, Alvin and Heidi. 1995. Creating a New Civilization: The Politics of the Third Wave. Atlanta: Turner

Publishing.

Toffler, Alvin and Heidi. 1980. The Third Wave. New York: Bantam.

Toulmin, S. 1990. Cosmopolis: The Hidden Agenda of Modernity New York: Free Press.

Vattimo, G. 1992. The Transparent Society. Baltimore: The John Hopkins University Press.

Weiss, Michael J. 1988. The Clustering of America. New York: Harper & Row.