The Ideal City and the Virtual Hive: Modernism and Emergent Order in Computer Culture

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‘The Ideal City and the Virtual Hive: Modernism and Emergent Order in Computer Culture’, in John Downey and Jim McGuigan, eds., *Technocities: The Culture and Political Economy of the Digital Revolution*, Sage Publishers, London 1999, 108-20.

‘Observers of media art’, wrote Herbert W. Franke, one of its most venerable practitioners, ‘notice that a new turning point has been reached. Perhaps this will lead to a decisive breakthrough. Art critics and philosophers are proclaiming the dawning of a new epoch, a “second modernism” characterised by the application of the new media.’ (Franke, 1996, 253) And, indeed, it is true that computer art now seems ubiquitous in exhibitions of contemporary art, and that over the last few years the literature dealing with computer culture has grown exponentially, and that it is full of proclamations.
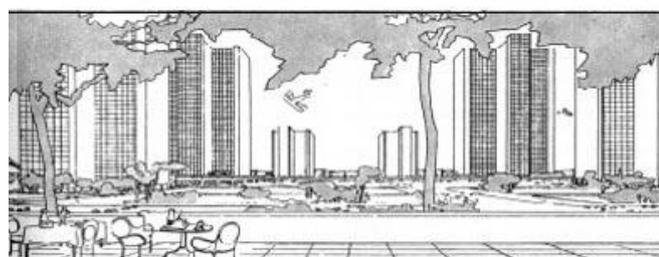
What we can learn about the ideology of network and computer culture from examining the way it looks? The visual element in computing has assumed ever more prominence, not only in business software but in the games which play a leading role in driving the technology standards ever upward. These looks may, of course, be taken as symptoms, but they are more than that. Given the concentration on the visual in the culture generally, and the increasing precipitation of culture at the level of the surface, the visual aspect of computer culture is no epiphenomenon. This essay will look briefly at the visual aspect of contemporary interfaces, but to examine tendencies and future developments, it will also examine the history of computer art, and the virtual environments constructed in current leisure software. Both are primarily focused on the visual, and both have developed styles and habits which affect computer culture as a whole.

As is well known, Walter Benjamin made a long study of the nineteenth-century arcades of Paris, by his time housing run-down collections of shops, from which he elicited visions of a transparent and transcendent architecture; despite their ostensible use, he thought, we could read from the structures of these buildings the utopian, universal moment, the broken promise, of bourgeois ideology.[1] It was a way of looking back to also look forward. In the same way, we may look to the Paris of Benjamin's time, to modernist visions of the 1920s for similar, and more explicitly utopian, material. Although these modern visions, from Le Corbusier onwards, have been subject to systematic and often effective attacks in other areas of fine art and architecture, they retain a remarkable affinity with much current computer art.

If we think first of Le Corbusier here, it is because he is the originary figure of utopian modernist architecture. He made of modernism's more rationalistic precepts a systematic and universalising system; in his city plans, zoned, functionally differentiated areas, standard units, and utterly straight roads created an order which was simultaneously social and aesthetic. These plans of the early and mid 1920s, such as *Une Ville Contemporaine* (1922), were a comprehensive attempt to solve material urban problems and to achieve social harmony and spiritual well-being.[2]
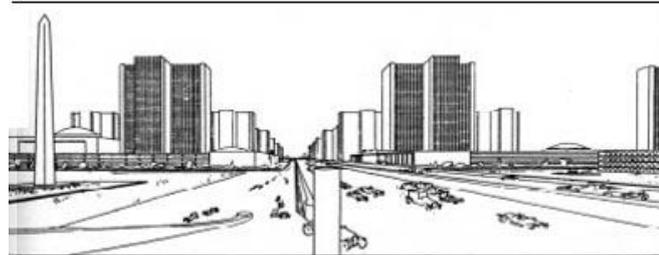
Although they were out on a technophile limb, Le Corbusier's recommendations were part of a wider conservative project current in France after the First World War which sought to bring anarchic, bohemian modernism into line, and which, on Jean Cocteau's agenda, sought

[1] Among the large literature on this, see Buck-Morss, 1989.
[2] For introductory reading on Le Corbusier, see Arts Council of Great Britain, 1987; Curtis, 1986; Moos, 1982.

to develop a 'degree-zero' language of form, a bureaucratic manner, so self-effacing as to escape the very description of 'style', allowing the message to flow directly forth.[3] Le Corbusier thought of his architecture as styleless, a flowering of rational thought about human needs and urban problems solved once and for all, with the additional leavening of a quantity of architectural genius. The simple primary forms of architecture or painting would speak universally and directly to the human organism.

Those of Le Corbusier's drawings which show his city plans from a distance resemble microprocessors—and this similarity is not fortuitous since everything was done to assure that traffic moved unimpeded at the highest possible rate to and from the central administrative core to the zoned, functionally differentiated elements surrounding it. Compact residential units or office towers were to be set in park-land, a contrast of opposites, zero and one. There was no room for (analogue) suburbs. As in the processor, the raw measure of efficiency was speed. The materialisation of this efficiency would produce beauty.

But it was not enough that Le Corbusier's early designs were rational expressions of what he took to be human needs. Given the cultural and economic obstacles to the immediate implementation of his plans, they also had to act as propaganda. In some of Le Corbusier's early villas, conventional frame and brick-infill construction (used because it was cheaper for a single building than concrete) was covered with a unitary layer of plaster, to suggest that the wall was composed of a single surface. So as well as being rational, his buildings had to *look* rational, even at the expense of a little dishonesty.

Such techniques, in which the aesthetic retires, leaving in its stead the very image of rationality is a familiar modernist trick; and is seen still in many aspects of our contemporary culture (car design, for instance, which make a point of looking rational, as do uniformly bureaucratic-looking system boxes and monitors), above all in software interfaces. The image of rationality condenses on the screen: *Windows*, the ultimate triumph of form over economy, poses as a rational system. Think of its particular features which have become so familiar that we tend to take them for granted; and how familiar it is all designed to be—the files and folders, those little thumbnail sketches

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[3] Cocteau, 1918. On the call to order, see Green, 1987, and Silver, 1989.

which so appropriately bear the name 'icons' (and these little pictures are often of familiar objects) the sculpted 3-D buttons, the pop-up notices, decked out with instantly recognisable, if not comprehensible, symbols warning of hazards or admonishing the user's mistakes.

The extraordinary advance in computer technology has largely served to bring to the 'desktop' ever more sophisticated interfaces which throw an analogue cloak over digital operations in an attempt to convince the user that handling a computer is some simple craft skill, largely dependent on manual dexterity. Endless concessions are made to computer 'dummies', to reassure them before this otherwise unyielding, even unnerving, device.[4] In an extraordinarily patronising display, the act of copying a file in *Windows 95* brings up an animation showing pieces of paper flying from folder to folder. The constant cheerfulness of the interface works against deep fears of inadequacy that may, as we shall see, be justified.

The images of rationality and familiarity, then, are thrown together. The latter is supposed to mitigate the alienating effect of the former—not just 'computer', says *Windows 95*, but 'my computer'—but the image of rationality can never be disposed of because it is at the core of the enterprise. It is also much needed as a mask. For, despite all the effort expended on it and the computing power thrown at it, the software industry's standard programmes are still fearsomely complex and quirky beasts: why, asks Clifford Stoll (thinking of Microsoft), does he need to have a thousand-page manual to find out how to write a letter to his friend Gloria? (Stoll, 1995, 66)

But surely, despite certain similarities—rationality taking the form of an aesthetic, and an aesthetic serving to mask the absence of rationality—to talk of the Le Corbusier of the 1920s is to talk of another age. His totalising schemes; his view of the aesthetic as an autonomous but complementary supplement to the rational which can, however, be objectively judged; his faith in the power of human reason and technology to solve the most pressing and difficult problems—all these views must have long since been buried by the voluminous critiques of postmodernism. But not, if you care to look, in computer art. There, highly traditional concepts of beauty, long called into question in other areas, still abound, and sophisticated technical means are frequently married to naive aesthetic

projects. Computer art has often been based upon idealist aesthetics, using explicitly Platonist models relating number and beauty. Its theorists frequently claim that the new technology has made possible objective progress in aesthetics.[5] Around computer art there is much talk which Le Corbusier would have found highly familiar, of aesthetic laws and their discovery, of mathematically generated or governed art. (This is not to say that such speculations are necessarily wrong-headed, but they are certainly modernist.)

Computer art is also dominated by an old-fashioned impulse to naturalism, to giving an immersive experience in 16.7 million colours at whatever pixel resolution (it has been calculated) necessary to make 'reality' appear at 24 frames per second. The measure of this naturalism is interesting, especially given the grounds on which the notion has been so frequently criticised: it is the physiological capabilities of humans. The ambition is generally to make a seamless, unitary environment in which the participant is inescapably immersed. As in high modernism, a technophile utopianism is abundant, one which assumes that art, and even what it means to be human, will be radically recast through the medium of technology—and this is a view naturally much encouraged by the computer industry.

What computer culture offers is the possibility of making an image of the ideal appear real. So the construction of paradises to be explored is a strong urge. Common are dreams of immersion and free flight, of soaring above unspoilt natural wilderness and sublime modern environments. Urban or pastoral, both visions are modernist, since they base their utopias upon a technical fix which carries us either to the Heavenly City or the Garden of Eden (Benedikt, 1991). They are as complementary as the relation of park-land and high-density tower blocks in Le Corbusier's schemes, being interdependent, inverse images of one another. In these digital scenarios, the promise of aesthetic harmony and an implied social calm, built on the foundations of a thoroughly linear system, produces a strong sense of déjà vu.

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[4] The titles of such books as 'Dos for Dummies' assure the reader that they are not alone in being foxed by computers and, indeed, that to be so is only normal, only human.
[5] See for instance Tom DeWitt who argues that formalism, as in musical notation, may be extended to the visual arts, founded on algorithms and the procedural languages used in programming (DeWitt, 1989). See also Popper, 1993, pp. 86-7. Similar arguments may be found in Franke, 1989. Another strand of activity, following the line pursued by D'Arcy Thompson and others since the 1930s, has been to study the structure of natural forms, and to write programs which generate similar shapes. It is visual rather

The same naiveté is found in much network culture; obviously a good deal of it is devoted to deliberately ridiculous trivia, or porn, or gaming, but to look away from the material to the unifying interface in which it is framed, the visual expression in the Windows or Mac systems is of a benign technocratic modernism; of ease and comfort in exploration, along with allusions to space travel. And it is travelling, as much as arriving, which is important: as for Le Corbusier, for whom cruising through the motorways of his city at the incredible speed of sixty miles per hour would allow the traveller to take in the order of the entire urban composition and to be in harmony with it, so in satisfactory Net exploration (rare, it must be said, in this country) it is the sensation of speed, of real matched to virtual geography that is often important (Le Corbusier, 1971, 177). Also, of course, that old modernist paradigm—discovery.

The powerful element of unashamed modernism in network and computer culture is surprising, if only because of the frequent theoretical claims that this is the pre-eminent arena of postmodernism. For instance, in writing of virtual 'rapes' on a MOO, one author recently warned against thinking of cyberspace as a utopia for 'the wounds of modernity are borne with us when we enter this new arena' (Poster, 1995, 86). To say that they are 'wounds carried with us' is to think that the wounding itself is over and done with, and that the injuries will eventually heal in the balming virtual environment. But computer culture is not contingently modernist: it is founded on a technology which is a living embodiment of the modernist, positivist dream of directed evolution and apparently limitless progress. If this outlook is mapped back onto the poor, static or evolutionarily slow human users of this giddily advancing technology, and allied to the highly 'reductive' science of genetics so that people begin to talk seriously about the 'post-human' (as they once did of the 'new man'), that, too, is not an accidental matter.

Yet computer culture now has not simply readopted modernism as if postmodernism had never existed. Modernism has been revived but has also been altered in the process. To understand this, we need to look briefly at the dystopian vision in computer culture. Apocalyptic elements are so prominent that it has become something of a cliché to think of computer culture as held between the poles of heaven and hell, utopia and dystopia. I want to highlight this issue by looking at the work William Latham, of one of the most prominent and successful British computer artists. Latham held a fellowship at

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IBM during which he collaborated with their programmers to develop his particular style and manner of working. His pictures and videos are known beyond the ranks of technophile high-art enthusiasts—through an album cover for Shamen, and the subsequent adoption of his work by Techno enthusiasts, and also because Latham is assiduous in courting the mass media. His configurable screensaver, *Organic Art*, marketed by Warners, has become a best-selling CD-ROM.

To briefly describe the process by which Latham makes his work, he constructs virtual objects from various pre-defined shapes, usually horns and tusks. These are then modified by a programme called *Mutator* which simulates evolutionary processes. Sets of numbers take the role of genes, while higher level programs determine structures into which the resulting forms are fitted. The computer presents Latham with a set of nine forms generated from a starting image; he picks the one (or more, if there is to be virtual 'breeding') he likes best on purely aesthetic grounds, and this is used as the basis for the next generation.[6] The final pictures are merely the 'fruits' of what Latham calls an 'evolutionary tree' (Arnolfini Gallery, 1988-89, 13). It is the survival of the prettiest.

Latham calls these images 'sculpture', but at a conceptual level they are peculiar works of art: sculpture usually involves three-dimensional material, shaped by an artist and standing apart from the viewer. These computer visualisations do not necessarily have any such qualities. Higher-dimensional forms may be indicated, while fractals provide a visual expression of fractional dimensions (Todd and Latham, 1992, 51). Such images may be thought of as the shadows of higher-dimensional forms, their insubstantiality and complexity being the result of their

reverse engineering geared to reproducing the look alone.
[6] See Latham and Todd, 1992, 64. Karl Sims has used similar programmes to navigate a field of possible trees, which were again selected on aesthetic grounds. See Levy, 1992, 211f. There are other artists pursuing this kind of work such as Yoichiro Kawagushi, who populates simulated undersea worlds with growing and mutating hybrid animal-vegetable 'creatures' with reflective skin. See Popper, 1993, 87-8.

materialisation in a form that humans can appreciate. Their apparent scale and material are arbitrary. Viewpoint, lighting, colour and texture, while they may also be controlled by genetic formulae, are independent of the structures depicted. As digital forms, nothing about them is fixed and they provide the possibility for the viewer to interact with or even virtually become the 'sculpture'.

The manner Latham chooses to display these virtual artefacts, incidentally, is symptomatic of some of the contradictions in the ever-emergent field of computer art. Although plainly there is no original for these works, and the idea of reproduction has no meaning, Latham uses these forms to produce conventional art objects, making high-resolution colour photographs, printing them in limited editions and selling them through art galleries. So despite the radical potential of a medium which could place a Latham 'original' on every computer linked to the Net, rare and valuable objects are produced.

Latham holds to a simple faith that computer technology can produce beauty but also has misgivings about computer-aided genetic tinkering on which he wants his work to critically comment. It reflects, he claims, 'the computer age, man's genetic manipulation of nature and comments on the wanton destruction of the natural world' (Todd and Latham, 1992, 208). We shall see that this is a little disingenuous. But the pictures do have a creepy side: one of IBM's programmers, John Woodmark, described the works as 'stark but perfect, hovering in emptiness and lit only by a remarkable illumination that lights every crevice with an equal glow', and commented that he is glad that the creatures are confined behind the screen (Arnolfini Gallery, 1988-89, 26). The work is unsettling, partly because it impresses the eye with a convincing physical model which, however, departs in small details from what we normally see; the ray-traced rendering of virtual objects does not model how light dims with distance, nor how objects cast light on each other, nor penumbral shadows. Latham's images are uniformly sharp and often exhibit an awkward dislocation of elements, patterns and surfaces. But beyond this, Latham is dealing with a form of emergent order, the process by which very complex forms and systems can be produced by simple determinants. We see in the apparently intentional construction of these creatures, the signs of a non-human intelligence at work, and this may more than anything explain our unease.

To return to and further the argument about the transformation of modernism, let us briefly consider another moment of idealism, 1968. Aside from other events for which it is better known, 1968 was a crucial year for the development of computer art. *Leonardo* commenced publication; Jack Burnham's book *Beyond Modern Sculpture* was published, promising the evolution of sculpture into the production of autonomous, intelligent Galateas; Robert Mallary started to make computer-aided sculpture; and computer art was consecrated as a recognised force in contemporary art with major exhibitions in Berlin and at the Institute of Contemporary Art in London, while in New York, the Museum of Modern Art, caught up in the buzz about electronics, announced the end of the machine age.[7]

Yet at the same time, famously, this was both the high point of revolt and the beginning of disillusion—for Jack Burnham, writing a few years later, computer and technological art became part of a rebellion against the very idea of avant-garde progress (which he and others saw as an elaborate but decodeable language game); a rebellion also against elite high art as a whole, and with it, many of the institutions and practices of the state and the economy (Burnham, 1971). Thinking of the permanently revolutionary and even iconoclastic art of modernism, and by contrast of the official bunkers in which it was housed, preserved and catalogued, he asked: 'is the ethos behind an invincible technology and a revolutionary art a reciprocal myth?' (Burnham, 1971, 41) Did both serve progress, did both unmake the world only to be unmade themselves as their products were assimilated by the system? There are various pernicious characteristics shared by science, technology and avant-garde art, argued Burnham: insane cycles of production and consumption, precociousness, fetishism, economic exploitation ... the list goes on (Burnham, 1971, 43). As high art drives itself into ever tighter circles of rebellion against itself, and, as a consequence, meaning is evacuated from it, the only way forward is for a great broadening of the practice of art, itself widely defined to include activist, radical acts—to make art democratic, local, natural. Technological art was linked, for a time, to a radical political and aesthetic project, promising the dissolution of high art along with the criminal institutions which sustained it.

Why is this moment of idealism important? Once again, there is the broken promise of liberal ideology. It is a salutary reminder that many of the social and political promises of

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[7] See Institute of Contemporary Arts, 1968; Technical University, 1968; Museum of Modern Art, 1968.

the Net were already being made twenty-five years ago or more, but from a very different position than that taken today by the editors of *Wired*, with their unqualified faith in the beneficent effects of unregulated capitalism. It allows us to see clearly the emaciated nature of the radicalism promised today. And it is only one of a sequence of promises made about one gadget or other—even about television in its infancy—that it would be the conclusive social panacea, that it would finally bring true democracy. No technology can do that alone; there are, after all, powerful, structural interests which exercise their influence to assure that it cannot. These interests also tend to control the development and deployment of new technology. Yet, forever forgetting this, computer art and computer culture, eternal infants, cross the river Lethe once again, emerging wide-eyed, promising the Earth.

Modernism, then, was initially met with a critique which stressed the importance of human autonomy and initiative, stressing grass-roots movements and emergent, egalitarian and non-prescriptive activity. When this ideal was defeated, both politically and culturally, some took refuge in virtual worlds where messy contingency could not check utopian construction. Only the form of the ideal was retained in computer culture, and in the anarchic Net promise of emergent culture—but the tendency was no longer to stress the potential of individuals but the inhuman force of the market. To think of this process in dialectical terms, a utopian, humanist modernism, defeated by political disillusion and economic recession was replaced by a dystopian, anti-humanist postmodernism. Within the arena of a resurgent computer art, however, and this is only the forerunner of a more general trend, a dangerous synthesis has emerged—a utopian anti-humanism. And it is this complex, contradictory form which ensures the shuttling of the culture between utopia and dystopia.

Latham's work is part of a much larger trend which is engaged in examining and often proselytising concepts of the 'post-human'. If there is something postmodern about computer culture, it is the attachment to the view that humanity has been somehow superseded, or at least that its time is beginning to draw to a close. These views may have radical or conservative aspects, whether it be Donna Haraway's politically-correct cyborgs, or remade third-sex creatures beyond gender and biological hierarchy, or rather drones servicing the network, married to the great corporate collective Netmind (Haraway, 1991). While it may be a pleasant pastime to spin utopian or dystopian

fantasies around the potential of these technologies, it is important to think not just about what is possible but what is likely. To do so, we have to examine computer culture today, and at the forces which drive its transformation.

Is contemporary computer culture a haven of politically radical activity, anti-sexism, anti-racism and solidarity with Third World peoples? You can, of course, find all these worthy qualities within it—alongside much overtly fascist material—but looking at it broadly, the answer has to be no. Think only of that media preoccupation, dildonics, or the high proportion of Net-searches devoted to finding pornography, or look at the advertisements in any of the gaming magazines. This is a culture which is both inconsequential and deeply conservative. *Doom*, the most popular PC game ever, is no more than an effective and violent shoot-'em-up—as is its successor *Quake*, the most hyped PC game ever. In both, aside from the obvious competence of the programming and the creation of a believable atmosphere, why such great success? Players are allowed considerable leeway to pursue their own tactics, but the basic idea is extremely simple; the enemies are demonic forces, single-mindedly devoted to the player's destruction. The player must become similarly single-minded and efficient in their destruction. *Doom* and *Quake* are very popular as networked games, creating between human players a particularly simple, all-or-nothing form of communication with virtual chainsaw, shotgun and rocket launcher.[8]

This is not to say that computer culture is worse than much other mass culture, or not at least much worse. As a form of mass culture it is, of course, largely commercially driven. Computer games create environments which are often hellish blueprints for the future or visions of the past. The virtual environments in which people currently dwell while working on computers are both more banal than such visions of heaven or hell, but also far from them in terms of meaning and action. (This was acutely visible in a recent performance by Stellarc, where the naked performer stood before the audience— a switching box strategically located over his groin—twitching and jerking in response to, or in control of, computer data and images thrown up on screens about him. But this fantasy or warning about a cyborg future was at odds with the Mac interface which so many people face every day. A little dog kept running—Stellarc's modified

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[8] A piece in *Wired* recently recommended Doom as an intuitive and reliable network environment in which people can compete and collaborate. Rupert Goodwins, 'Doom with a View', *Wired*, May 1996, pp. 37-8.

hourglass—while the computer threw up system errors. Everyone held their breath, waiting for the thing to crash.)

So it is easy to come up with characteristics of computer culture which are manifestly modernist, or which exhibit qualities which have traditionally been linked with modernism—at least, in postmodern critiques of the old tendency: sexism, racism, technophilism, single-minded and reductive narratives, and so on. It is much harder to refute the claim that the culture as a whole is somehow postmodern. But this difficulty, we should note, is to do with the nature of postmodern readings themselves; courting contradiction and relativism, there are naturally few explicit criteria with which to judge the suitability of a reading (there are implicit ones, of course, but we all know about those). So it is easy for postmodern critics to seize on some aspect of Net or computer culture and claim it for themselves.

And, indeed, we have seen that computer culture is a hybrid—modernist in its technophilism, its fetishisation of functionality, and its steadfast ideology of progress; postmodern in its post-humanism, happy as it is to proclaim people the slaves of the new machines, as modernism (in practice, if not in words) had made people slaves of the old. In this new compact, postmodernism loses its quietism, the sense of resignation which made it content to conduct its wordy battles in the academy, letting the 'real' world (which, after all, had only a dubious status) to take care of itself. But one of most the disturbing things about (what should it be called?—I hesitate to employ the term, after Kroker's use of the 'virtual class')[9] 'virtual modernism', is that the tasks Le Corbusier left to the Cartesian intelligence are now abandoned to the computer. Modernism's utopian content was often, and certainly in the schemes of Le Corbusier, much tied to order and hierarchy—and to authoritarian political schemes (McLeod, 1985). Yet within the haven created by such order, people were supposed to attain their potential and express their individuality, they would be equal but also diverse. People were the measure of the system.

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[9] See Arthur Kroker and Michael A. Weinstein, *Data Trash. The Theory of the Virtual Class*, New World Perspectives, Montreal, 1994.

The modified modernism of network culture is apparently far less attached to order, though that is implicit at least in interface design, but is also less tied to human values.[10] So the question becomes: how does the culture treat people, how does it make them act, what does it tend to make them become? Weiner's well-known work on feedback systems may provide a useful way of thinking of the human-computer 'interface' (Weiner, 1989). Net browsing in particular is just that—a feedback system in which human input is reduced to discrete mouse clicks, measured out in time and money.

What kind of human nodes does a collective, emergent Net culture require? Only dumb ones—or may it use smart ones, if people's cleverer actions cancel each other out, as lying is assumed to in opinion polls? This was an issue even in the early days of computer culture, when Robert Mallary wrote: 'Using particular and bounded energy systems, such as human beings, as well as dispersed and ambient systems, such as crowds and technological and ecological forces. Finally, plug in (as it were) the total electronic environment as a source of the transductive [ie. interactive] signals to shape, catalyse and energise the computer sculpture.' (Mallary, 1969, 33) Here people act as mere elements, serving a wider cultural whole. Does such an order permit the self-consciousness of its agents to be expressed? Are we talking about the development of a democratic forum or a termite colony? Given all the hype about the radical political implications of the Net, what does it mean to extend the democratic project, to foster new communities or create a new public sphere when what it means to be human is rapidly changing, or, for that matter, when the mere presentation of individuals in cyberspace is arbitrary and constantly transformed?

To go back to Latham for a moment, we have seen that he produced an interactive screensaver employing the processes of Organic Art. The resulting forms are unforseeable (by humans, obviously) and unrepeateable, and have a certain richness to them, despite certain cheesy pre-set elements. But the richness is all the computer's. Human interaction is limited to the picking of options, and that activity is highly controlled, limited and measurable. The point, then, is not whether emergent order requires dumb elements, but that humans surely can act as just that, becoming one of the inputs used in the construction, say, of complex marketing maps, charting the multi-

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[10] I suppose it is necessary to defend the use of such a term. See the discussion in Steven Pinker, *The Language Instinct. The New Science of Language and Mind*, Penguin Books, London 1994, pp. 413f.

dimensional relationships between different determinants, such as class, sex, race and the propensity to purchase lottery tickets.
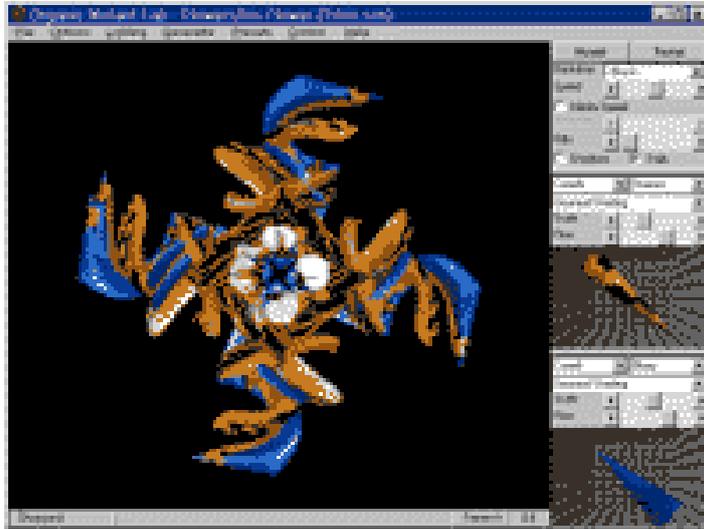
Now if, as Burnham argued, avant-garde art and technology share certain undesirable features, perhaps they also carry within them solutions to the problems they create. As we have seen, some people find Latham's images disturbing, and it may be that this response is not entirely irrational. The techniques of genetic computing can be turned to a variety of commercial applications—IBM's support for the artist was far from being pure altruism. Genetic algorithms can be turned to generating spreadsheets as well as the images of strange creatures. They can be used, indeed, to generate and navigate through a vast number of financial plans. The advantage of this evolutionary approach over programmes which merely optimise plans for a given scenario is that planners may recognise in the mutated results prospects for some outcome which they might never have otherwise considered. The immense advantage of running these plans virtually rather than using real resources and real labour is obvious. The computer, just as it is capable of mutating the elements of stick figures representing people, can juggle with prices, and investment, employment and lay-offs.

Now this process simulates what economists term 'discovery', a matter that has always been an intractable problem for planned economies (Adaman and Devine, 1996). Given any particular scenario, through the competition of numerous private firms, many different alternatives are tried out, and the most successful is discovered and rewarded. In this never-ending process, the economy produces more knowledge about itself than

is actually held by any of the individual participants, no matter how resourceful or well-informed. Successful competitors may just be lucky, rather than frightfully bright and knowledgeable.

Obviously the genetic generation of plans can be used to simulate discovery, giving individual companies the ability to survey the field, letting them try out a multitude of virtual plans before committing themselves for real, so providing them with this market knowledge in advance. Of course, the programme will only be as good as its economic model and the accuracy of the data it uses, but this is surely where networking comes in, making possible the automated seeking out and analysis of widely scattered data.

If discovery can be made virtually, then one of the main justifications for competitive markets is removed; a planned economy can exploit the maximisation of resources which is produced by discovery, and, when it comes to judging the variety of possible plans, criteria other than profit maximisation and shareholder benefit can be considered. The emergent order of the market can be emulated, and directed toward more human ends.

There is another consequence, however: if virtual discovery remains in private hands, firms will sooner or later have to build into their programmes the calculations of competitors' virtual discovery programmes; it could be that formerly rational courses will no longer be so, and that in this circumstance humans have little hope of hitting upon the courses that are made newly rational. What we may see, in other words, is a situation where raw computing power gives very great wealth to its owners, creating positions of fixed privilege which are even harder to shift than they are already.

To briefly sum up: the current manifestation of computer culture is not postmodern but an intensification and transformation of modernism, one which openly serves, not the needs of people, but those of 'higher' powers, in particular the universal power of the market. This has little to do with the technology as such—which might indeed hold out the prospect of radical change—but is determined by the current social hierarchy. The promise of the modernist ideal city has been transformed into the virtual hive, an ordered environment to which drones contribute their highly circumscribed signals.

Why is technophobia so prevalent? Why do computers have to dress themselves up with cartoon characters or 'friendly' icons—why the triumph of the computing 'dummies'? It is surely not just computers' inherently non-human nature but that they have and continue to be used for deeply anti-human ends; from the design and control of weapons to the calculations by which a bank decides how many workers it can afford to lay off. In the present circumstances, the ideology of capital dominates that of the Net and of computer culture in general. But it does not have to be that way: it is possible to see how, in a very different society, this non-human technology might be turned towards the most human of ends.

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