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CARFAX

New Urban Eras and Old Technological Fears: Reconfiguring the Goodwill of Electronic Things

Nigel Thrift

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Summary. The literature on electronic telecommunications technologies has been infected by the virus of new era thinking, a virus which is simply another variant of technological determinism. This paper is an attempt to expose this virus and it is in four parts. The doubled introduction questions the idea of novelty by paying attention to current writings on 'cyberspace'. The second part of the paper then extends these introductory comments by considering the way in which technological determinism was used to explain the electronic communication technologies of the 19th and early 20th centuries. It is argued that these same habits persist in current writings on the effects of 'new' electronic communication technologies. The third part of the paper illustrates some of these arguments by reference to the history of one of the most concentrated examples of informational space, the City of London. Finally, the doubled conclusion points to what does seem to be novel about the current technological conjuncture by attempting to listen to historical experience.

Introduction

> My approach will be marked by mechanical confidence or creative uncertainty, according to whether I consider everything to be worked out in advance or everything to be there for the taking... .(Guattari, 1995, p. 134)

Introduction 1

What is 'new'? It is only recently that the question of novelty has been explicitly addressed by writers in the social sciences. Yet the idea of novelty is at the root of these writers' *raison d'être* since the delegation of what is (and what is not) 'new' is a critical part of their practices. Most particularly, this delegation is bound up with conceptions like 'modernity' whose very existence depends upon the identification of a different time in which novelty is continually and remorselessly generated (Osborne, 1995). Nowhere is the question of novelty brought into starker relief than in recent work on electronic communication technologies. For many writers these technologies are the living proof of a powered-up modernity, and one of the lemmas of this proof is that these technologies are self-evidently 'new' (Henning, 1995). To expound any other point of view is to be open to the criticism of a 'retro-orientation' which denies the existence of a whole new world of 'warp-speed accelerations',

Nigel Thrift is in the Department of Geography, University of Bristol, Bristol BS8 1SS, UK. Fax: 0117-928-7878. E-mail: Thrift@gma.bris.ac.uk. *The author wishes to acknowledge the incisive comments of Nick Bingham, Denis Cosgrove, John Urry and an anonymous referee in preparing the revision of this paper. He would also like to acknowledge the comments of the audience at the Arnolfini Gallery in Bristol in March 1995, the Ninth Urban Change and Conflict Conference at Royal Holloway in September 1995 and the 'virtual geographies' session at the Royal Geographical Society (with the Institute of British Geographers) conference at Strathclyde in January 1996.*

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'telecommercial hypermanic cultures', 'hungrily expanding spatialities' and 'virtual human obsolescence' (Land, 1995).

But, in principle at least, this view of the role of the new electronic telecommunications cultures is not one that automatically has to be drawn upon. I want to suggest that the elements of an alternative account, an account which ranges itself against the bluster and hyperbole of the epic and epochal accounts which are now almost automatically associated with writing on the new electronic telecommunications technologies, is starting to be put in place.

This account will be made up from the following elements: an attention to the cultural practices of electronic communications technology, of the kind found in the literature on computer-mediated control of work (Star, 1995); an attempt to refigure the relationship between people and machines that leaves neither term inside or outside of the other one but brings both terms together in specific actor-networks and a turning-away from the sterile notion of modernity towards notions of historical change which are slow-moving, complex and interconnected, and in pieces (Latour, 1993).

At one level, this stance simply allows the history of electronic telecommunication technologies to be seen as long and sinuous, as evolutionary rather than revelatory: "What we have is not so much a digital culture in the sense of new media overtaking and display old ones, as the increasing digitalisation of older media" (Henning, 1995, p. 231). For example, Winston (1995, pp. 230–231), in reply to one of Bukatman's (1993a) more extreme paragraphs describing the advent of a new information age, writes:

> Telephones worked by 1880, television by the early 1930s. Digitalisation, the key to the current phase of development was demonstrated as a technique in 1938. A computer ran a factoring programme in 1948. And the convergence of these technologies, via telephony, has gone on as each has come on-stream.
>
> If one adds gestation periods, one can note that the essential architecture of the computer was first articulated in 1837; the physics of the solid-state electronic device were outlined in 1879; the idea of television was patented in 1884; and the basic mathematics of digitalisation theorised in 1928. Indeed if one were to conceptualise these developments as starting with the physical exploration of electromagnetic phenomena one could say that they had been coming on-stream for the better part of two centuries—or even four.
>
> So what has been proliferating recently? Certainly not television screens and telephone wires which have been diffused for decades. The cable television system has been building since the late 1940s. As for digital devices in the home, they are not yet as ubiquitous as analog television and telephones, despite being introduced in 1974 (Atari Video Game), 1976 (Apple II Computer) and 1978 (CDs). It is therefore two decades since this 'new' three-pronged domestic 'proliferation' of the digital began.

But at another level, this stance is part of a more general attempt to refigure historical change as a complex set of different times which: conjures up a 'present' which no longer has to be considered as contemporary; produces a past which is no longer out-of-date; and, constructs a future which is no longer the race for first place. As Serres (in Serres and Latour, 1995, p. 45) puts it:

> In order to say 'contemporary', we must already be thinking of a certain time and thinking of it in a certain way.... So let's put the question differently: What things are contemporary? Consider a late-model car. It is a disparate aggregate of scientific and technical solutions dating from different periods. One can date it component by component: this part was invented at the turn of the century, another, ten years ago, and Carnot's cycle is almost two hundred years old. Not to mention that the wheel dates back to neolithic times. The ensemble is only contemporary by assemblage, by its design, its finish, sometimes only by

> the slickness of the advertising surrounding it.

This paper is a first attempt to sort out some of these issues as they impinge upon how we attend to electronic communication technologies. My intention is to produce narratives of these technologies which do not attempt to impose a particular additive and singular politics of time by hijacking history in the name of the new.

Introduction 2

There is a mode of writing about electronic telecommunications technologies which is now becoming ubiquitous. According to this body of literature, what we are seeing is nothing less than a new dimension coming into existence. This new space (and, interestingly, it is nearly always a space) goes under many names—Graham (1996) lists the 'space of flows' (Castells, 1989); 'postmodern hyperspace' (Jameson, 1991); the 'netscape' (Hemrich, 1992); the 'network' (Harasim, 1993); 'data spaces' (Murdock, 1993); 'telegeography' (Staple, 1992); and 'cyberspace' (Gibson, 1982; Benedikt, 1991) to name just a few—but they all signify the same thing:

> The space of information. This proliferating multidimensional space is virtual, densely webbed, and infinitely complex, a vast and sublime realm accessed through the mediation of our imaginative and technical representations. How powerfully we engage this information space depends on how powerfully we both manipulate and inhabit these representations, these phantoms ghosting the interface (Davis, 1993, p. 86).

Cue moody or even menacing music, soaring corporate towers that are lit up like Christmas trees, slowly moving rivers of headlights, and all the other sub-*Bladerunner* clichés we now see almost nightly on television documentaries about the growth of cyberspace.

What is interesting is how often the space of information is represented in these urban terms: as a parallel urban landscape with its own key nodes of command and control; as a means of visualising information space with databases transformed into corporate towers and computer networks into information highways, and, more generally, as a means of generating all manner of new metaphors and metonyms. At the same time, the modern city is itself transformed by its information space 'shadow'. Thus Graham (1996) can also list the contemporary city redescribed as the 'non-place urban realm' (Webber, 1968), as 'the invisible city' (Batty, 1990); 'the informational city' (Castells, 1989); 'the wired city' (Dutton *et al.*, 1987); 'the telecity' (Fathy, 1991); 'the intelligent city' (Laterasse, 1992); 'the virtual city' (Martin, 1978) or 'the virtual community' (Rheingold, 1994); 'the electronic community' (Poster, 1990), 'the over-exposed city' (Virilio, 1987), and even 'teletopia' (Piorinski, 1991).

In this paper, I want to lay down a challenge to the kinds of 'new era' accounts of information spaces which we usually associate with those kinds of urban clichés. Three of these new era accounts seem to hold a particular power at present. The first consists of *fin-de-siècle* celebrations of the end of life as we know it, which usually involve a good helping of the kind of 'reverse humanism' (Poster, 1995) favoured by Baudrillard, De Landa (1991), Kroker and Weinstein (1994) and Land (1994, 1995). The second account is made up of doom-laden pronouncements about our acquiescence to the means-end values embedded in high technology which duly threaten our ability to encounter experience meaningfully. Dating especially from a revival of interest in Heidegger's discussion of technology and Habermas' later ruminations on instrumental reason, recent examples of these pronouncements can be found in Feenberg (1991) and Simpson (1995). Finally, there are solipsistic ramblings of the 'me and my computer' variety which paint the technological experiences of the author as somehow symptomatic of a post-modern culture (e.g. Wiley, 1995; Spender, 1995).

I want to argue that each of these very different accounts of information spaces tends to sink very quickly into remarkably similar forms of 'highway hype', 'techno-babble' or 'digital dreaming'—inflated claims about the power of electronic communications technologies which commit one or more of a series of besetting sins.[1] In particular, these accounts seem to me to be: motivated by a passion for absolute certainty and order, masquerading as its opposite; transfixed by a series of élite representational discourses caught up in their own denial; and, driven by a desire to fix on metaphors of modern life like speed, circulation and travel, which were already tired before they were recycled last time around. Ironically, the real message of each of these accounts of informational spaces seems to be "*inevitability*—not what the future *might* hold, but the inevitable hold of the present over the future—what the future could not fail to see" (Landon, 1989, p. 143). Most depressing of all, too often these accounts seem to lack any *social* dimension, the sense that living, breathing, corporeal human beings arrayed in various creatively improvised networks of relation and affinity still exist as something more than machine fodder, and that human concerns like "sex, death, race, and gender strongly infiltrate (each) little corner of cybernetic paradise, just as they inhabit the visionary musings of anyone concerned with how the cultural tensions of today will unfold in the unpredictable worlds of tomorrow" (Springer, 1994, p. 732).

Why should this be? Why should these accounts so quickly slough off the uncertain and the human? I want to argue that, whether these accounts of new informational spaces claim to predict the future (as some of the more 'economic' accounts actually seem to want to do) or are operating in a 'symptomatic mode', providing a prognosis about the place of technology in current Western societies, or recognise themselves as "not primarily about understanding new technologies but rather how to take active pleasure in them" (Springer, 1993, p. 4), they have all retained deeply engrained habits of reading technology which "date from exigencies of the industrial and resolutely patriarchal nineteenth century" (Springer, 1993, p. 89), habits which even now can still be encapsulated in the phrase *'technological determinism'*.

This paper is about how we can begin to expunge these habits so that we can, at last, begin to see our technological landscapes in a non-deterministic way. In turn that means, I think, that we have to modify our claims to knowledge, and no longer attempt to conjure up images of the world as a purified order, comprised of epics and tragedies, but rather see it as a commotion of situated knowledges which we can only ever chip away at (Thrift, 1996).

This paper is therefore in three parts. In the first part, I want to outline some of the 19th-century habits of technological determinist thinking that still reveal themselves in 'new era' writing on new informational dimensions and city forms. I want to argue that these habits of thinking cannot hold and I want to sketch some alternatives which can "move us away from what has turned equally sour—cultural nostalgia and technological euphoria" (Pfeiffer, 1993, p. 12). In the second part of the paper I want to fix on what is currently one of the most concentrated examples of an 'informational space', the City of London. Here I want to show that this space, replete with instantaneous communications, real-time corporate databases, artificial intelligences and the like, is also the most social of places, partly *because* it now exists in 'cyberspace'. Finally, by way of a double conclusion to the paper, I want to point to what *does* seem to be novel about the present technological conjuncture by attempting to listen to the groans and whispers of previous historical experiences.

New Eras, Old Errors

> From the postal system and the electric telegraph to the telephone and the computer, every major innovation in the transmission and processing of information has

> been hailed by contemporary observers as a harbinger of a new order of the ages. (John, 1994, p. 101)

It is always dangerous to generalise, but we might say that new era accounts of informational spaces and their accompanying telematic cities have been characterised by the following identifiers.

- They are produced by the rise of electronic networks and databases.
- They invoke new modes of time (Lash and Urry, 1993; Urry, 1994) including an instantaneous world time which results in "a type of *general arrival* in which everything arrives so quickly that departure becomes unnecessary" (Virilio, 1993, p. 8; Pinney, 1992), and a new 'depthless' historical time (Jameson, 1991).
- They signal new spatial logics which respect none of the apparently Newtonian constructs of space which characterise our physical lives in cities.
- They are connected to the rise of images and signs as the means by which our society makes sense of itself.
- They deal in metaphors of flow, movement and circulation.
- They speculate about new means of control, based on telecommunications (Deleuze, 1992).
- They provide new options for commodification.
- They provide a challenge to current forms of subjectivity or, *in extremis*, they challenge the notion of subjectivity itself, thereby generating new subject positions which Bukatman (1993a, p. 26), for example, calls "terminal identities": "an unmistakably doubled articulation in which we find the end of the subject and a new subjectivity constructed at the computer station or television screen".
- They question corporeality, even suggesting it may have had its day.

Now, what I do not want to do here is to describe the exact status of these changes—whether they are happening, the pace at which they are happening, and so on. I am, it is true, suspicious of some (but not all) of the claims and even more suspicious of their extent (Thrift, 1995), and other authors share my views. For example, Woudhuysen (1994) has documented at some length the history of exaggeration associated with new era writing, and the reasons why new informational spaces and telematic cities will never reach the ascendancy that is often claimed for them. But what I am more concerned with here is how new era accounts are made over discursively into techno-epics heralding techno-epochs and how we can forge alternatives to this strategy which recognise the importance of new technologies without either jettisoning the human or assuming that it is under mortal threat (Poster, 1995).

Why do we find that new era accounts so often end up producing masculine fantasies of omnipotent machine power or of human beings set free by machines? There are two reasons, I think. One is quite straightforward and is hardly either surprising or unique in the social sciences. These accounts have "an *a priori* agenda which overdetermines their readings of their materials, without any care for their historical placement or their generic properties" (Barker, 1995, p. 189). The other reason is more subtle but, ultimately, more important. These accounts have bumped up against the limits of 19th-century thinking on electronic telecommunications technology, limits which, with the benefit of several rounds of technological hindsight—from the telegraph on—are now much clearer to see than was perhaps once the case.

Let me expand on this latter point. I want to call on the thinking from the period when these "old technologies were new", to use Carolyn Marvin's (1988) felicitous phrase, and especially thinking about the telegraph and the telephone which produced the prototypical electronic informational spaces, to illuminate the problems that we still face in thinking about technologies now (Marvin, 1988; Czitrom, 1982; John, 1994). As we find now with their contemporary descendants, these "new electronic media were sources of endless fascination and fear,

and provided constant fodder for social experimentation" (Marvin, 1988, p. 9).

When we look back at this thinking, we can see that the commentators of the time ran up against eight main imaginative borders, borders which still seem to persist and which, taken together, describe the kind of thinking that I want to label technological determinism. First of all, commentators tended to fix on and argue from *extremes*. Thus, the usage of a new electronic telecommunications technology in one particular way was too often extended to how it would be used overall and everywhere. For example, the early commentators on the telephone were convinced it would mainly be a tool of business. Domestic applications were rarely considered (Fischer, 1992).

Secondly, these technologies were assumed to replace technologies that had gone before. Thus, attention was focused on the new technologies to the exclusion of the old with the result that the combination of 'modern' technologies with 'anachronistic' technologies was rarely if ever considered, whilst the real alternatives that existed at particular points in time were written out (Gershuny, 1992).

Thirdly, new electronic telecommunications technologies were nearly always presented as *de novo*, prompted by the enthusiastic writings of the scientists and engineers for whom these technologies were important investments. They were described as smooth, crystalline systems, which rarely broke down and rarely needed repair. In particular, these systems seemed to need no work to keep going. The mistakes and imaginative improvisations which are normal elements of technological systems were almost never mentioned, thereby writing out much of these technologies' human component.[2]

Fourthly, the new electronic communications technologies were nearly always presented as a coherent, consistent and cumulative whole. Yet, recent historical analysis suggests they often had divergent effects, and operated in different ways for different people, at different periods in history as particular technologies and their accepted uses evolved.

Fifthly, new electronic communications technologies were often assumed to be likely to spread everywhere rapidly, and to have the same effects everywhere and rapidly, a kind of 'techno-orientalism' that, in part, has been linked to 19th-century fantasies of empire, and especially to the fantasy of the empire as a total archive of information gathered up through the new technologies (Richards, 1993; Barker, 1995). Thus, it is worth remembering that, even now, between a third and a half of the world's population still lives more than two hours from the nearest telephone (Sabbagh, 1994).[3] Equally, it seems unlikely 'that participation in the emerging information, imaging and communications technologies will ever (in the meaningful future) expand beyond a minority of people on the planet' (Crary, 1994, p. 20).

Sixthly, new technologies were rarely seen as part of a linked repertoire of practices. But no technology is ever found working in splendid isolation as though it is the central node of the social universe. It is linked—by the social purposes to which it is put—to humans and other technologies of different kinds. It is linked to a chain of other activities involving other technologies. And, it is heavily contextualised. Thus the telephone, say, at someone's place of work had (and has) different meanings from the telephone in, say, their bedroom, and is often used in quite different ways.

Seventhly, the metaphorical structure that was used to understand the onset of new electronic telecommunications technologies nearly always configured them as part of a second usually, distanced nature. The primary reference point was usually the orders (and disorders) of the human body (Armstrong, 1992; Marvin, 1988; Nye, 1990; Selzer, 1992). The metaphors of change were waves, shocks, currents and various natural disasters, and the stories were of how this second nature would bite back. For example, one common concern was that people's subjectivity would come under threat. As one

commentator described the new electrical age:

> It seems to us that we are getting perilously near the ideal of the modern utopia when life is to consist of sitting in armchairs, and pressing a button. It is not a desirable prospect; we shall have no work, no money, no motivation, no youth, no vices, no individuality. (*The Electrician*, cited in Marvin, 1988, p. 124)

Another concern was that people's bodies would be transformed, made over into electronic machines. Thus:

> Nineteenth-century observers were especially interested in how men might change their biological constitutions or their ways of waging war in response to machine imperatives, and both experts and laymen wondered how man measured up to electricity conceived as a supernatural or supercultural form. Perhaps electrical machines were cultural artifacts superior to man himself. Perhaps they were debased cultural forms, or perhaps they were a highly advanced form of nature, destined to drive man from his fragile position in the cosmos, rather than to help him establish its security. (Marvin, 1988, p. 141)

Eighthly, and finally, new technologies were *re-presented* through texts and in images. These re-presentations, which tend to accord primacy to textuality and imageability, inevitably filtered out the performative 'presentations', the 'showings' and the 'manifestations', that characterise technology actually *in use* (Thrift, 1996). In turn, these representations washed away other important aspects of new technologies. In particular, they tended to underplay the sensuous nature of their presence in lived experience, what Prendergast (1992) has called 'epidermal sensibility'. But, of course, new technologies always register in a whole series of sensory modes—the ocular, but also the tactile, kinaesthetic and auditory. For example, reading involves not just the art of seeing but also the feel of the paper, the smell of the book, and so on. That the sensuous nature of new technologies was lost was also, at least, in part, the result of the way in which intellectual commentators tended to use people to

> represent the most creative energies and functions of critical reading. In the end they are not simply the cultural student's object of study, his native informants. The people are also the textually delegated, allegorical emblem of the critic's own activity. (Morris, 1988, p. 17)

Nowadays, these bounds to thinking about new technology are often encapsulated as four different but related traps that we fall into when writing about technology and society. First, writing about new technologies has nearly always involved the idea of a purified system which moves indomitably on its way through a society, an unstoppable glacier, changing all before it and stamping out everything behind it. But, as Latour (1993, p. 138) has pointed out, the idea that such purified systems exist is the enemy of good social science:

> Where does the threat come from? From those who seek to reduce (the *anthropos*) to an essence and who—by scanning things, objects, machines and the social, by cutting off all delegations and senders—make humanism a fragile and precious thing at risk of being overwhelmed by nature, society and God.

Or, one might add, technology. In other words, we need to return to more modest and less formidable ideas of technology as implicated in actor-networks which take work to build up and maintain:

> Take some small business-owner hesitatingly going after a few market shares, some conqueror trembling with fever, some poor scientist tinkering in his lab, a lowly engineer piecing together a few more or less favourable relationships of force, some stuttering and fearful politicians; turn the critics loose on them, and what do you get? Capitalism, imperialism, science, technology, domination—all equally absolute, systematic, totalising. In

> the first scenario, the actors were trembling; in the second they were not. The actors in the first scenario could be defeated; in the second they no longer can. In the first scenario, the actors were still quite close to the modest work of fragile and modifiable mediations, now they are purified and they are all equally formidable. (Latour, 1993, p. 126)

Secondly, the idea of technologies as purified systems can take hold because societies are depicted as smoothly functioning wholes through which technologies can pass unproblematically, rather than as only partly connected networks through which technologies pass not *unevenly, but differently*, providing complex outcomes which are mediated in numerous ways. (The importance of difference is only accentuated in the case of electronic technologies which demand an active relationship with their users (Strathern, 1992).)

Thirdly, and following on, too often these purified technological systems are, to use Bernstein's (1994) phrase, 'foreshadowed'. That is, they provide an apocalyptic history of inevitable moments leading inevitably towards a predefined goal or fate which historians already know, a goal or fate in which everything becomes faster, and more compressed in space and time, more commodified, and so on. This logic of historical inevitability depends upon the dubious idea that history has a coherence other than what we impress upon it. It is rather like someone running through the town after the Pruitt-Igoe Flats were dynamited in 1972 shouting 'post-modern capitalism has begun'. (In its most pernicious variant, foreshadowing leads to what Bernstein (1994, p. 16) calls 'backshadowing' in which "the shared knowledges of the outcome of a series of events by narrator and listener is used to judge the participants in those events, as though they too should have known what was to come". Found most commonly in retroactive accounts of the Shoah, this practice is also common in accounts of the onset of new technologies.)

Fourthly, too many accounts of purified and purifying technology systems suppose that they form part of a general erosion of the social and that we are moving inevitably towards a more abstract, decontextualised, dehumanised and generally disenchanted world, one in which the life-world is taken over by the system, 'authentic' spaces by programmed consumer spaces, tactics by strategies, humans by machines, and so on. But this argument is more often assumed than demonstrated and many authors are now beginning to believe that our world may not be so very different from the worlds that have gone before it and that such a view rests on a series of false and unproductive oppositions nature and culture; technology and society; and primitive and modern, for example (Knorr-Cetina, 1994; Latour, 1993; Ingold, 1995; Moore, 1995; Stafford, 1995). Perhaps the assumption of disenchantment arises, then, from sticking with descriptions of something which are increasingly what Douglas (1966) has called 'out of category'. This means that we cannot recognise (or have not recognised until recently) the depth and complexity of the 'sociations' that surround us which have become, now, the source of so much comment (see Giddens, 1991; Beck *et al.*, 1994). Thus, to take just one example, that of the apparent increase in secularisation in some Western countries, the fact that some regions of the world have apparently experienced secularisation may just mean that new forms of religion are out of category with what we have conventionally regarded as religion (as the blossoming study of new age religion, implicit religion, and so on seems to imply). In other words,

> The thesis of the disenchantment of the world fails in several ways. First, it rests on the equation of the content of particular belief systems or modes of operation—which have changed—with 'substance', 'meaning', 'the life-world', etc. in general. If the proposition of the 'loss of meaning' in modern and postmodern life is stripped out of this equation it amounts to a historically plausible but trivial assertion about

> the changing nature of meaning structures. Second, the assumption of the increase in formal, technical and abstract systems ignores the phenomenon that these systems are never abstract when enacted. Presumably, the meanings of abstract elements lies not in their formal definition but in their use. Third, the thesis fails in that it has not been systematically documented empirically. In fact, assessments like that of a trend towards the elimination of the life-world are ironic in the face of the ... microsociological studies in the last thirty years which demonstrate the procedures and forms of organisation of the life-world. (Knorr-Cetina, 1994, p. 6)

Certainly, much of the current literature on new electronic technologies suffers from the same difficulties of explicit or implicit technological determinism as were found in the writings of the nineteenth century. Two forms are the most prominent (Fischer, 1992). The first is a 'symptomatic' form in which new electronic technologies are metaphorical expressions of a current culture or geist. In this form of determinism, the new technological order provides the narrative mill. The new machines become both the model for society and its most conspicuous sign. The second form of technological determinism is less sweeping, but is still highly directed. Here, the new electronic technologies alter history by a process of cultural and psychological transfer of their essential properties to their users. For example, Kern (1983) takes on board a widely—and long-held view (see Porter, 1993)—which infers that space-transcending technologies like the telegraph and telephone, and the bicycle and automobile, were able to communicate their essential properties of instanteneity and speed to their users, who became more tense, alert and time-conscious as a result. Leaving aside the difficulties of evidence, such a relationship is by no means self-evident. For example,

> In the use of the automobile, one could reason that the replacement of the horse and train by the automobile would have sped up users' experiences. This may sometimes be so, but not always or perhaps even mostly. Travelling by car rather than train probably led, according to a historian of touring, to a more leisurely pace. People could pull over and enjoy the countryside, 'smell the roses'. Similarly, farmers who replaced their horses with motor vehicles could travel faster to market, but many apparently used the time to sleep in longer on market day. (Fischer, 1992, p. 11)

Similarly, Meyrowitz (1985, p. 115) argues that electronic media have

> lead to a near total dissociation of physical place and social 'place'. When we communicate through telephone, radio, television, or computer where we are physically no longer determines where and who we are socially.

Thus all places become like others, cultural distances between places are erased and privacy is reduced as areas of life previously sheltered from public view are recorded. Like Kern,

> Meyrowitz reasons from the properties of the technologies to the consequences. Electronic media are 'place-less', so people lose their sense of place. (Fischer, 1992, p. 11)

Yet, like Kern's account, the reasoning is defective. For example,

> Meyrowitz argues that, unlike letter writers, telephone callers can pierce other people's facades by hearing sounds in the background of the other party. Thus the telephone breaks down privacy. But why not instead compare the telephone call to the personal visit or the front-step conversation? If telephone calls have replaced more face-to-face talks than letters, then the telephone has increased privacy. (Fischer, 1992, p. 12)

In other words, what is still not well understood is that each new technology must take on complex cultural meanings which are by

no means self-evident and which allow certain machines, for example the piano, to be seen as 'natural' and others, like the computer, to be seen as unnatural. Why? Because, we live in a culture

> that has over time slowly grown a language and models for close relationships with certain machines. The harpsichord, like the visual artist's pencils, brushes, and paints, is a tool, and yet we understand the artist's relationship with these can (and indeed, will most probably) be close, sensuous and relational. (Turkle and Papert, 1990, p. 153)

This process of social acquaintance is still taking place with the new electronic communications technologies. And, even in their comparatively short life-span, these technologies have changed their meaning. At the most general level, cultural anxieties expressed in metaphors of information excess, overload, bombardment or glut are now being replaced by more positive orientations expressed in metaphors of highway, dance and surfing (Collins, 1995). More specifically, the process of social acquaintance has produced many new forms of 'techno-textuality' which rest on markedly different interpretations of the cultural legacy of electronic telecommunications, which do not cohere, and which do not have to cohere. Thus Collins (1995, p. 6) can write of the impact of information technology on music in these terms:

> These radically new forms of textual production are obviously constative elements of the Age of Information, but in order to understand the complex interaction of cultural expression and information technology, we need to examine how excess of information and its accessibility have affected all those other 'anachronistic' low-tech areas of cultural activity as well. This is not just a matter of recognising the sophisticated forms of resistance to the semiotic excess that have developed alongside radically new technologies. ... It also involves recognising the ways in which both deconstructive and neoclassical architecture, both industrial rock and 'neo-traditionalist' country music are reactions to the same semiotic excess, and their realisations depend on their ability to access and refashion the 'already said', which is now decidedly the still being said due to the technologies of information storage and retrieval. In other words, the Age of Information is defined not by the ongoing struggle between the futuristic and the anachonistic (which is in and of itself not sufficiently appreciated by techno theory), but even more importantly, by the ways in which that very opposition is being reconceptualised in cultures defined by the simultaneous presence of phenomena like cyberpunk fiction and neoclassical architecture, but also 'cutting-edge' Early Music ensembles. (Collins, 1995, pp. 6–7)

Let me summarise the argument so far. What is missing from technologically determinist accounts, and what must be re-embedded if we are to understand modern informational spaces and telematic cities, is any concerted sense of new electronic communications technologies as part of a long history of rich and often wayward social *practices* (including the interpretations of these practices) through which we have become '*socially acquainted*' with these technologies. As Marvin (1988, pp. 4–5) has argued, that means that what she calls the 'instrument-centred' perspective, in which the instrument determines the effect, is much too narrow[4] because the history of electronic technologies;

> is less the revolution of technical efficiencies in communication than a series of arenas for negotiating issues crucial to the conduct of social life: among them, who is inside and outside, who may speak, who may not, and who has authority and may be believed. Changes in the speed, capacity, and performance of communications devices tell us little about these questions. At best, they provide a cover of functional meanings beneath which social

meanings can elaborate themselves undisturbed.

If artifactual approaches foster the belief that social processes connected to media logically and historically begin with the instrument, then new media are presumed to fashion new social groups called audiences from voiceless collectives and to inspire new uses bred on novel technological properties. When audiences become organised around these bases, the history of a new media begins. The model used here is different. Here the focus is shifted from the instrument to the drama in which existing groups perpetually negotiate power, authority, representation and knowledge with whatever resources are available. New media intrude on these negotiations by providing new platforms on which old groups confront one another. Old habits of transacting between groups are projected onto new technologies that alter, or seem to alter, critical social distances. New media may change the perceived effectiveness of one group's surveillance of another, the permissible familiarity of exchange, the frequency and intensity of contact, and the efficiency of customary tests for truth and deception. Old practices are then painfully revised, and group habits are refined. New practices do not so much flow directly from the technology that inspire them as they are improvised out of old practices that no longer work in new settings. Efforts are made to restore social equilibrium, and these efforts have significant social risks. In the end, it is less in new media practices, which come later and point toward a resolution of these conflicts (or, more likely, a temporary truce), than in the uncertainty of emerging and contested practices of communication that the struggle of groups to define and locate themselves is most easily observed.

I want to illustrate some of these points in the next section of this paper by considering one particular set of communities of practice which are often regarded as at the heart of the modern informational space.[5] This is the set of communities who are involved in international finance. It has become one of the fixed clichés of modern life that massive amounts of money now circulate the globe at the press of a button (or, more accurately, the touch on a screen) and this virtual monetary space is often regarded as the avatar of postmodernity (see, for example, Denzin, 1991; Jameson, 1991; Castells, 1989; Harvey, 1989; Wark, 1994). Yet, I will argue, when we move away from the instrument-centred perspective we find something very different. The rise of electronic telecommunications networks may well have produced more, not less, sociation, much of it face-to-face. In other words, we do not find an electronic world swept of people, we find hybrid 'actor-networks' of people and electronic things (Haraway, 1991; Latour, 1993; Law, 1994), 'communities of practice' (Lave and Wenger, 1991; Star, 1995) which have long and involved histories and traditions. New forms of electronic detachment have therefore produced new forms of social involvement. It is not a case of either/or, but of both/and. In other words, the example of international finance yet again shows the sterility of a 'cybercultural history that believes only in the newness of all phenomena, as though the world itself had been entirely reborn in the electronic era' (Bukatman, 1993b, p. 628). Historical depth is not, therefore, an incidental moment in the task of explanation, but a necessity.

The First Telematic City? The City of London

I want to fill out these thoughts by reference to the example of an archetypal telematic city: the City of London. Over the last 140 years this small space has been one of the key centres of a globally extensive web of telecommunications; what was once the telegraphic heart of the Empire of British commercial capital is now one of the electronic hearts of an international imperium of commercial capital. More than most spaces, it can therefore be figured as a way station in

an extra-ordinary world of speed and immediacy, dematerialised like the money it serves, the haunt of the ineffable real, a moment in the constitution of the monetary sublime. Indeed this is a favourite interpretation of contemporary intellectuals (Harvey, 1989; Wark, 1994). But in a series of papers (Thrift, 1990, 1994a, 1994b, 1995; Thrift and Leyshon, 1994), I have tried to show that such a depiction is flawed, blinded by its own technological hyperbole which prevents its authors from seeing that this world is still, even given the growth in quasi-mediated interaction (Thompson, 1995), a world of ordinary human practices which have a complex historical genealogy.

Seen in this light, electronic communications technologies are no longer an economic, social and cultural earthquake but rather a part of a continuing performative history of 'technological' practices, a complex archive of stances, emotions, tacit and cognitive knowledges, and presentations and representations, which seek out and construct these technologies in certain ways rather than others (sometimes before they even exist) and which therefore ascribe what is new about them (Pickering, 1995).

In this section, I want to illustrate some of these propositions by reference to the history of the three key instruments of electronic communication—the telegraph, the telephone and computerised telecommunications—in the City. I want to show, first of all, the impossibility of separating out the instrument from the practices of which it is always only a mutable and mobile part. Then, secondly, I want to argue that, as in the past, so in the present, there is no sense that the latest developments in electronic communications have produced an abstract and inhuman world, strung out on the wire, by reference to developments in City practices which both contain the germ of older technological practices and are being constantly adjusted to the performative possibilities provided by getting acquainted with new electronic communication instruments.

The growth of the City's informational space began with the installation of the telegraph which gradually integrated British financial spaces (for example, the London and Glasgow Stock Exchange were linked in 1847), allowing prices to converge and small time-period arbitrage to become a possibility (Thrift, 1990). The process of integration was slow at first—the first telegraph systems were vulnerable to the weather and suffered from considerable problems of capacity. But these problems were overcome so that by 1905

> It was estimated by the Post Office that the average time of transmission on [the London–Glasgow] route was a mere $2\frac{1}{2}$ minutes; 70 per cent of all telegrams were sent within 5 minutes of report and 97 per cent under 10 minutes. Though delays could, and did, continue to take place 'due either to falling wires or sudden pressure', it was normal to send a message, have the deal done and receive confirmation well within the half-hour, and this had been the case since at least the 1870s. (Michie, 1987, p. 9)

In any case, many of the problems of the system were able to be overcome by those City firms who installed private wires. For example, between 1870 and 1895 about 60 of these wires were installed between London and Glasgow.

Until the invention of the telegraph, the City's global reach had relied on the mails and, fastest of all, the carrier-pigeon.[6] But, in 1851 the first element in the City's global informational space was put into place, with the laying of a submarine cable between London and Paris.[7] The two cities were then able to be linked by telegraph, allowing news (including stock prices) to be transmitted back and forth within business hours. Other European cities followed suit and by 1860 the Barings' banker John Bates could note "Received a telegram that the contract had been signed and despatched per mail, so that we shall have it in 5 days. The Telegraph is beginning to be much used and very useful" (cited in Kynaston, 1994, p. 168). In July 1866, the first submarine cable connection was made between London and New York,

with immediate effect on the rapidity of market adjustment between the two cities (Kynaston, 1994). In 1871 some 42 000 telegrams were already being sent between the two cities and by 1877 *The Economist* was able to remark that, so embedded had the use of telegraph become in the business of international finance telegraphic transfers, together with international coupons, were superseding the bill as a means of remittance (King, 1972). The telegraph and its attendant 'cable boys' made it possible

> for the first time to trade systematically, and with a fair degree of confidence, in future delivery, rather than taking a gamble on a very risky speculation since it was possible to anticipate expected supply and demand with reasonable certainty... The telegrams, and later the telephone, and their use by intermediaries meant a qualitative change in the degree of risk... (Michie, 1992, pp. 55–56)

This is not to say that the new business practices attendant on the telegraph were never contested. For example, even as late as the 1880s and 1890s there was still concern at the way in which the telegraph made forward commodity trading a possibility. In a debate which still has echoes today, concerns were expressed over the propriety of future rather than actual delivery on the American model. Was it an incitement to speculation, or a harmless way of hedging bets in a fluctuating market? Thus, as Kynaston (1995, p. 20) notes

> In 1894 some of the qualms surfaced in a reprobatory article in the *Contemporary Review* on 'Market Gambling'. The author... noted the vastly increased amount of futures dealing in corn that had taken place in recent years in both the USA and Liverpool, and went on
>
> > It is satisfactory to state that the great majority of merchants in Mark Lane set themselves resolutely against the abominable system, and regard any firm taking part in it with suspicion. On the Baltic, the importer's market in London, option dealing takes place, and the men who deal in options have their Produce Exchange [i.e. the London Commercial Sale Rooms in Mincing Lane] and Clearing-house. It is considered on Mark Lane, however, somewhat 'shoddy' to belong to the comparatively small clique in London who have adopted the American fashion of dealing in grain.
>
> It was clear, however, which way the trend was going, and especially clear that by providing facilities for forward dealing, the City was safeguarding its international position. Perhaps significantly, the markets that dealt in futures preferred not to use that term, an American one, but instead preferred to call themselves terminal markets, deriving from the French word for time.

Whatever the particular reservations associated with particular financial instruments, by the 1880s the telegraph was an integral part of the City business day, etched into the practices of the City as though electronic stock dealing had always existed, as this account by *The Statist* of the situation in 1886 as the New York market opened at 3 o'clock makes clear

> Visitors to the City who are not familiar with its ways must observe a good many scenes which puzzle them. If they chance to be loitering about Bartholomew-lane or Throgmorton-street between three and four o'clock in the afternoon they may see telegraph boys racing along at a breakneck pace... They dash across streets, shoot round corners like greased lightning dodge past hansoms, and rush up stairs into demure looking offices in the most unceremonious fashion. As soon as they reach the door they shout "cable!"... But these fleet footed youngsters may make as much noise as they please, and nobody objects...

> The afternoon cable race is one of the recent developments of Stock Exchange enterprise. It is carried on in the interest of the "arbitrageurs", who buy and sell on the small margins of difference there may happen to be between London and New York markets. Arbitrage is also practised between London and the chief Continental Bourses, but on a smaller scale and with less scientific methods. On the Continent it is done largely between one Bourse and another; in fact, it is of foreign origin, and foreigners take the lead in it even here. The market which offers the finest scope for it is American railways, the daily fluctuations in these stocks being active, and the deviations from parity between the New York and London prices being often considerable...
>
> Translating dollar prices into sterling prices at the exchange of the day—a rate which is seldom two days alike—involves intricate calculation. Tables have been framed to facilitate the process, but an expert 'arbitrageur' carries in his head about all that he needs for his purpose...
>
> From a quarter past 3 o'clock onwards the cables come pouring in. They have to be sent out from the cable offices to the offices of the arbitrage houses. There they have to be turned into sterling prices, and these compared with the London prices at the moment. Like a flash of lightning the 'arbitrageur' has to decide what he will buy and what he will sell. He rushes to the House and has his business done for him... Then he cables back to New York to 'cover' his transactions, that is, to buy against what he had sold or to sell against what he has bought. It may be also that his partner or agent in New York has entered into transactions which he must cover here if he can. The game is played simultaneously from both ends, and like duplex telegraphy there are generally two accounts of speculation crossing each other. Scores of buyings and sellings may be going on together, each of which carries a certain degree of risk, but the arbitrageur's hope is to come out right on the general balance. He makes his risks, so to speak, insure each other, and so long as the differences are comparatively small he stands a fair chance to come out well. The arbitrageurs themselves say that it is the small profits they make most by. A wide fluctuation in a stock, while a transaction in it is being covered, is pretty sure to end badly. If it is against the arbitrageurs, great judgement has to be exercised in deciding whether the loss should be cut at once, or the transaction kept open on the chance of its righting itself...
>
> Having the first cable from Wall Street of an afternoon is better that having a 'moral certainty' for the Derby. The second cable is worth a good deal less, as the jobbers are quick enough to see how the wind blows from the west. If the arbitrageurs are buying they put up prices, and if they are selling they put them down. It is only the early bird that catches the arbitrage worm, and the late birds are more likely to be caught themselves. That is the moral of the headlong racing among the cable boys, of the lightning calculations, and the rushes of excited clerks into the House about half-past 3 o'clock. Capel Court and Wall Street are like two arms of a delicately poised balance. They are always deviating from the level, but the slightest touch brings them back to it. By forestalling that slight touch the arbitrageur makes his living. (cited in Kynaston, 1994, pp. 348–349)

The high point of telegraph usage in the City was the turn of the century. For example, in 1903 an average of 2.4 telegrams per minute were being transmitted into and out of the Baltic Exchange (Kynaston, 1995). But the ascendancy of this instrument was now threatened by the practice of the telephone. Thus, by 1904, *the telephone* had also impinged on the operation of arbitrage between the London and New York markets.

> By rapid degrees the American fluctuations became generally circulated; one market seems to be full of the little pink slips that came flying in at the hands

> of boys and clerks stationed in a line that stretches from the offices of the cable companies outside the House to the very heart of the Yankee Market in the Stock Exchange. Again, the telephone and telegraph come into requisition, and the House usually finishes up, unless there is really nothing doing, in a state of more or less mild excitement. (Duguid, cited in Kynaston, 1995, p. 301)

The telephone added to the array of electronic telecommunications, that the City wielded in significant ways and it is no surprise that the City had the first two telephone exchanges in Britain (in 1879)[8] and had many telephone users from an early point in time, including worthies like the Baltic Exchange, which installed lines as early as 1881 (Barty-King, 1977). In 1902, the Bank of England finally installed telephones, symbolically assuring their importance for the City, and by 1910 the number of telephone subscribers had already reached 10 000.

Some of these subscribers were putting their telephones to heavy use. For example, in October 1908, 81 883 outwards and 23 916 inward calls were made or received at the Stock Exchange telephones linked to brokers' offices.

> "In approximate terms, this meant that a telephone call was made every 6 seconds and one received every 21 seconds during the whole day, and this excluded all subsequent office calls". (Michie, 1987, p. 13)

At first, the telephone had been used purely for local calls within the City but, as in the case of the telegraph, telephone wires gradually linked Britain's financial spaces together. Indeed, by 1889 a programme was in hand to link the London Stock Exchange with the provincial stock exchanges by means of direct cables, thereby avoiding delays created by routing via local telephone exchanges. But, around 1900, again just like the telegraph, private dedicated telephone wires began to be used by a few City firms, each line costing about £20 000 per annum to rent. The example of the Stock Exchange is again instructive. By 1904, ten London Stock Exchange firms had rented direct lines to the provinces and

> by keeping [the line between the offices of Stock Exchange markets and provincial brokers] open throughout the day, and allied to each broker's different telephonic links from his office to his own exchange, a continuous and immediate two-way contact was established between trading in London and activity elsewhere. This facility was superior to that of the public wires, which were soon relegated to handling the less important business. (Michie, 1987, p. 14)

The existence of the direct lines lead to the increasing importance of certain financial practices like the 'shunting' of securities and also, ironically, to the strengthening of the dual capacity system of brokers and jobbers, precisely in order to give the Stock Exchange the means to fend off such practices.

As this example makes clear, there was still significant resistance to the new telecommunications technologies in some parts of the City. For example,

> a residual mistrust (of telephones) was felt even at a progressive firm like Schröders, where Baron Bruno allowed one only on condition that the firm's number was omitted from the telephone directory, on the ground that incoming calls would be a distraction from business. (Kynaston, 1995, p. 252)[9]

Bastions of conservatism held out even longer against the new technology and the most conservative of all was the Stock Exchange which consistently refused to make full use of the new telegraphic, and then telephonic communications, encouraged by the Stock Exchange's lack of control over the building it used (which was provided by a company which derived its income from the fees paid by the members). Thus in 1868, a request to install an exchange telephone was turned down by the management and much pressure had to be exerted by the members to

make the management give way. The telephone was also perceived as a threat.

> The first application to introduce a telephone service between the London Stock Exchange and the outside subscribers was made in November 1879. It was rejected. It was not until the Exchange was enlarged in 1882–3 that a telephone room was provided and even then the facilities remained inadequate, inconvenient and of limited use. Faced with the continued refusal to provide proper facilities for telephones, in July 1888 the members threatened to find an alternative to the facilities provided by the Stock Exchange unless the managers gave way. The management backed down, putting only normal obstruction in the way of further expansion; the year 1888 marked the end of any serious resistance by the management to the changes created by the communications revolution. (Michie, 1987, p. 20)

Yet, even as late as 1905, one frustrated member of the Exchange was able to write to the *Financial News*:

> Our members have every right to expect facilities such as do exist on other Exchanges. Every frequenter of the Exchange is aware of the quantity of outside institutions which have sprung up, and which, by the aid of private telephone boxes outside the Exchange, are doing a large and increasing business, securing their customers in the provinces, on the Continent, or in America, either as outside brokers or arbitrage dealers, on terms more advantageous than the 'House' man can offer. Look around Shorter's Court, under the new building... and you will see innumerable busy telephone manipulators. You have in this Court two cable companies, who, unable to gain access to a corner of the 'House', again swell the messenger boy's brigade.
>
> Why should the members of the 'House' not be able to install their direct telephonic connections inside the building? Why again, should the cable companies not be permitted to have their room within the building, thus gaining our paying members a slight start in receiving, and sending their messages?
>
> At Lloyd's, the Baltic, and elsewhere, the exchanges provide a most exhaustive supply of telephonic communications, which are posted up as soon as received. Barring a very scanty supply of news over the Exchange (tape) machine, we are left to our own resources. (cited in Kynaston, 1995, p. 403)

Even by the second decade of the 20th century, the Stock Exchange still doggedly held its own telegraphic way of proceeding; and even this was generally slow and inefficient relative to competitors.

The Stock Exchange's record in the international sphere was only slightly more inspiring. The Exchange proved itself reluctant to increase opening hours after the opening of the Anglo-American telegraph in 1866.[10] Even as late as 1904

> the ten firms doing large-scale arbitrage business in the American market had vainly asked the managers for pneumatic tubes to be provided from the offices of the Anglo-American Telegraph and Commercial Cable Companies into the Stock Exchange: in 1907 the managers gave their usual niggardly response when the Exchange Telegraph Company sought improved facilities in order to speed up the process of transferring price changes to the tape, which, the company stated, competed unfavourably with the swiftness of the 'ticker' service on the New York Stock Exchange: over the next two years the managers agreed with only the greatest reluctance to erect more telephone boxes; and in 1911 a number made a vain complaint... about the poor telegraphic facilities between the Stock Exchange and the Continental bourses.... (Kynaston, 1995, p. 403)

It is no surprise that an American visitor to the Stock Exchange in 1913 could so easily contrast the difference in attitude to the new

communications technology between the London and New York Exchange;

> Here in New York there is a slapdash come and go system that is greatly facilitated by the use of the telephone and the private telegraph lines. A single commission house has 10 000 miles of licensed lines. In London, where telephone and private lines are but sparingly used, both by brokers and clients, a broker often finds on his desk in the morning, three or four hundred letters and telegrams; the care and attention required to handle an enormous lot of orders given in this deliberate manner is something with which the New York stock brokers are quite unfamiliar. (cited in Morgan and Thomas, 1962, p. 164)

Still, for all the frustrations, the number of telephone subscribers continued to increase. Thus by 1939 there were three City telephone exchanges, serving 46 000 subscribers in all and the City had become one of the hubs of global telephonic space. Thus, in 1937, a telephone link between London and New York was initiated. By 1940, it was already possible for one commentator to describe a foreign exchange dealing room of the 1930s in terms redolent of those used today.

> To describe exactly what goes in the foreign exchange room of many of the big banks or foreign exchange brokers who comprise the London Foreign Exchange market is beyond me. It is the nearest thing to the Bedlam that I know—half a dozen men in a little room, shouting in incomprehensible jargon into Telephones, pushing switches up and down all the time in response to the flashing indicator lights.
>
> All the telephone talk, moreover, is not confined to the London network of lines. Every now and again a bank in Paris or Amsterdam or Zurich will come through on the touch line, and in the afternoon when the American market has opened, there may be a stream of telegrams coming in from New York. The fact reminds us that the foreign exchange market of London... is not an isolated market, but is part of a single active market in world currencies. (Hobson, 1940, p. 61)

In 1956, the Foreign Exchange market reopened after the war as an all-telephone market and it has operated as such ever since.

By the 1920s, the telegraph and the telephone had been integrated with other forms of electronic telecommunications like wireless telegraphy (introduced in the 1920s) to produce a City of London that was becoming recognisably modern in its attitudes to the use of technology. Along the way, the telegraph and telephone had also stimulated many other *hybrid technologies*. There was, for example, the pneumatic tube, used to communicate the short distances between terminals (for example, linking the floor of the Stock Exchange with the Telegraph office pre-telephone). Then there was the ticker-tape, a teleprinter with an operator and a staff of reporters collecting prices from the Stock Exchange floor which provided a record of prices—at six words a minute. Invented in 1867, it was used on Wall Street for some time before being imported to London by the Exchange Telegraph Company in 1872, as a service to Stock Exchange members, but also some merchant banks and outside brokers. But, the service was not as popular as in the US, perhaps because it transmitted a list of prices only four or five times a day compared with the continuous American services. For example, one American writer of 1913 noted that the machines were "limited in number, almost nobody looks at them, and many enterprising houses do not install them at all" (cited in Morgan and Thomas, 1962, p. 163). However, in 1928, a continuous service was installed by Reuters, providing commodity and currency as well as stock prices (Read, 1992).

From an early point in time, the City had been interested in the potential of *computers* for payment and settlement purposes to replace the high-speed mechanical sorting and tabulating equipment that had been the norm. For example, in the late

1950s the London-based Association of Clearing Banks had an Electronics Sub-committee, with a major assignment to automate bank payment processes—and in 1971 this did indeed happen when the Bankers Automated Clearing Services Ltd (BACS) began trading in London (Kirkman, 1987). But computers made their major appearance in the City in the 1960s. In 1966, for example, even the normally reticent Stock Exchange installed one. Even so, adoption of computers was a relatively slow business (in 1971, *The Banker* revealed that 'the computerisation plans of some of the British banks are seriously behind schedule'), most particularly because it took time for their uses to be explored.

Even so, that process of exploration meant that in the 1960s the telephone and telex were already being merged with the new computers to produce recognisably modern forms of *telecommunications*. There were four main imperatives behind this amalgamation. The first was that the extant telephone systems were becoming simply overburdened.[11] Secondly, information was needed more and more quickly because of the reciprocal increase in generally available information and connectivity, and the speed-up in response times resulting from new technological-organisational arrangements. Thirdly, this information then had to be analysed, sieved and sorted. Fourthly, it became correspondingly more important to be able to locate people quickly[12] to put them in touch with information and analysis.

To begin with at least, commercial news and information were able to be transmitted directly to customers, and did not have to go through intermediate offices and agents to be redirected on via a combination of teleprinter, telex, telephone, mail and messenger. Then, in 1964, the first computerised price quotation service was offered. By 1968, over 10 000 commodity prices were available at push button demand, at first in 15 seconds, later in 2 seconds. In 1970, this system was put on to screen display.

> There is an entirely new Market Price Display Service. More than 1200 television receivers have been installed in some 250 offices around the City, and each of them can display information on 22 channels. The System is linked to a Ferranti computer. (Jenkins, 1973, p. 102)

In 1973, spurred on by the break-up of Bretton Woods, and the consequent expansion in foreign exchange dealing, a real-time interactive quotation service was established which, for the first time, allowed customers to input data. This was necessary because dependency on telephones and telex was proving unsatisfactory.

> Since by the time an answer to a request for (say) a bank's dollar/sterling price had been given and transmitted, that price might well have changed. Seconds were important. (Read, 1992, p. 30)

Finally, in 1981, came computerised dealing. Advertisements for this new product emphasised speed—how the new product offered the opportunity to conclude deals in 2–4 seconds, compared with up to 10 seconds with the then-current methods.

> Only through Reuters could dealers communicate with each other at high speed to buy, sell, or lend money through the same screen, taking hard copies of transactions from an associated teleprinter. They still had to work out their own deals, since this was not yet 'matching' but the new scheme was a great advance... By the second anniversary in February 1983 the Dealing Service had 400 subscribers in 24 countries; 37 of the worlds' top 50 banks were participating; calls through the system were averaging 10 000 per day. A year later calls had doubled again, with peaks of 40 000 in active markets. (Read, 1992, p. 311)

In the 1990s, the City is still one of the world's major telecommunications hubs providing high-volume, low-cost services (Ireland, 1994; City Research Project, 1995) via a wide variety of different modes of connec-

tions.[13] These modes of connection now include direct small-disk satellite delivery (first made available in 1982), microwave, and fibre optic rings (the first of which began construction in 1983; there are currently five operating in the City controlled by BT, Mercury, Energis, Colt and MFS) as well as older modes. These new modes of connection, along with increasing computational power, have produced the following results: electronic networks which operate in all stages of the process of trading and settlement (Mansell and Jenkins, 1993); so-called intelligent networks (which, for example, allow 0800 numbers to be transferred from city to city around the world according to time zone, offer specific services to different customer segments, provide private networks, and can offer billing on floppy disk); and, certain primitive forms of artificial intelligence (for example, neural network systems involved in currency dealing). The City, in other words, is one of the major hubs of a global 'informational space' which is probably one of the closest approximations to information space and the telematic city that currently exists.

Yet, there is no sense that these developments have produced an abstract and inhuman world, strung out on the wire. And there are good reasons why this is so. Three of these stand out. First, the new informational space has produced as much confusion as certainty. The problem is no longer lack of information. Instead, it is too much. As one of the Vice-presidents of the New York Stock Exchange put it "we're drowning in data" (cited in *The Economist*, 25 August 1995, p. 75). The information explosion in part comes from the simple process of being able to use information technology to make much more information available to many more people (Khan and Ireland, 1993). But there is more to the process than this. Information technology can also be used to generate information that was previously unavailable (Zuboff, 1989). This information which can be used to generate new products, as in the case of the exotic financial products produced by 'rocket scientists', adds to the uncertainty. Further, information technology is not a neutral medium. It produces new forms of communication, new forms of rhetoric and narrative possibilities, new norms and conventions, which complicate how and what 'information' is delivered (Ferrara *et al.*, 1991).

In turn, this means that the major task in the information spaces of telematic cities like the City of London becomes interpretation, and, moreover, interpretation *in action* under the pressures of real-time events. Since the international financial system generates such a massive load of information, power goes to those who are able to offer the most convincing interpretations of the moment. The problem is no longer necessarily a shortage of information but how to make sense of the masses of information that exist. Thus the generation of convincing interpretive schemes becomes both crucial and, at the same time, a more and more difficult achievement in the face of growing numbers of possible interpretations of each and every event.

Part of the hunger for interpretation has been answered by the media. Increasingly global in character, the media provide a bewildering variety of interpretations from newspapers, to specialised financial publishing, to tipsheets, increasingly in electronic form (Parsons, 1989). But it is possible to argue that the media are

> as much a part of the problem of interpretation in that they often provide multiple and confusing explanations of financial events, leading some commentators to talk of the relativism of the electronic age. (Smith, 1983, p. 325)

Another part of the hunger for interpretation has been answered by the new forms of representation that the more recent electronic telecommunications technologies themselves made possible; from graphical interfaces to computer graphics and animation. But these can only help to a limited degree.

Thus the many workers in the City who depend on 'correct' interpretations for their living tend to fall back on other means.

These practices are most obvious in the largest and most volatile markets where, as one stock dealer put it, "the one obvious problem is that you're only as good as your last bargain. Each day starts a new complete sheet" (Lazar, 1990, p. 58). In these circumstances, dealers tend to fall back on specific social cliques (Baker, 1984) which cleave to particular interpretive schemes. Four of these schemes seem most common. We might call these schemes; fundamentalist, evangelical, charismatic and spiritualist (Cosgrove, 1996). There are first of all, then, those who believe in economic fundamentals. They constitute the blunt end of the financial markets:

> They are looking at economies and the fundamental values which lie behind currencies and the demand there. When fundamentalists analyse shares they dissect individual companies' accounts, assessing the true worth of the share. In commodity markets, they study crop reports, mining returns, and the changing patterns of demand in consumer countries. In all cases, there will, of course, be as many different schools of thought about the relative importance of various factors as Christianity has sects. (Roberts, 1995, p. 116)

The Bank of England view is typical of a relatively fundamentalist stance. For the Bank, market movements are:

> A reflection of a host of factors and underlying forces, some driven by fundamental economic developments, some responding to movements in relative interest rates and asset prices, some moved by technical or seasonal conditions, and some reflecting long-term trends. Understanding these factors can give us useful information about how economic goals are responding to the monetary stance we are pursuing and hence how far we are succeeding in pursuing our monetary objective of price stability. But the information is inevitably jumbled and laced with a great deal of extraneous 'noise'. It needs to be decoded. (Associate Director, Bank of England, cited in Roberts, 1995, p. 114)

The second 'evangelical' interpretative scheme is concerned with price, regardless of value. It involves the belief that "the market has a life of its own" (Smith, 1983, p. 48), and is best studied technically via charts of various kinds. One study of the City (Taylor and Allen, 1989) found that for short-term time-horizons, 90 per cent of dealing institutions used some charting and for two-thirds charts were at least as important as economic fundamentals. So-called Chartists have formulated their own well-formed vocabulary and methods of analysis over time:

> 'You work very hard at your charts. You look at them twice a day on a consistent basis across a variety of currencies. And you try and work out what's going on. (trader, cited, in Roberts, 1995, p. 120)

The third 'charismatic' interpretative scheme is one which conceives market events in strictly interpersonal terms with the result that key individuals ('who really know what's going on') and powerful institutions who can move markets are taken as benchmarks. The fourth and final 'spiritualist' interpretative scheme is one which is based on market psychology, on a 'feel' for the market.

> I think that what it really comes down to is psychology. The markets are all about psychology. It's not about how intelligent you are. It's about how lucky you are and how well you can read what the next guy's trying to do. (trader, cited in Roberts, 1995, p. 120)

Certainly, the fact that 'irrational' indicators like round numbers (De Grauwe and Decupere, 1992), low trading levels on Mondays, as well as the existence of bubbles and fads, have been shown to be important in market behaviour over and over again, suggests that this last schema has as much to recommend it as any other.

Of course, these four schemes are often merged in practice. Thus one trader (cited in

Roberts, 1995, p. 176) uses most of the schemes:

> There are people who trade off fundamentals and others who trade off the feeling they have for the movement and the flows. There's not one particular approach that a dealer should use. The dealers have access to all types of information which is necessary for them to take. And they pick and choose what is important to them for the way they trade and their particular style of trading.
>
> I like to look at charts as a confirmation of something that I'm feeling anyway. If I feel strongly about something I look at the chart and say 'Is the chart agreeing with me, is it telling me that my timing's wrong or that I'm totally wrong'... Another thing that I really find valuable is contacts in the market. I know a good few people in the market, talking to these people during the day. They'll say different things to us which will help you form a view.

The uncertainty of the markets breeds other interpretative schemes as well. Astrology has become an increasingly popular means of interpretation. And, superstitions are rife:

> Unpredictability breeds superstition, too. We had one very good dealer and we had a building site just outside with a crane... 'And he'd say "The crane's moving to the left, that's sterling going down, going to the right, it's going up". People have their little ideas like that, as well. (Roberts, 1995, p. 180)

The second reason why it is impossible to see information space as an abstract and inhuman space, strung out on the wire, stems from the way that City people interact knowledgeably with the available electronic communications technology. Here it is important to remember, first of all, that City people are practised in this kind of technology, socialised into its use over more than a century. We can therefore expect that they are relatively unimpressed by the newer electronic communications technologies coming on line and soon become acquainted with and incorporate them (Fischer, 1992). Outbreaks of 'techno-fear' seem to have been comparatively rare in the City. For example, Read (1992) mentions some resistance to screen-based trading when it was first bought in the early 1980s but this seems to have soon broken down. Secondly, City people stress the use of a repertoire of electronic technologies, working side by side, in new combinations: the old co-extensive with the new. For example, a trader will still use the telephone and messengers along with touch screens, e-mail and fax. Thirdly, electronic communications do not take place in one step in a smooth and integrated cyberspace (Mansell and Jenkins, 1993). Rather, they take place through a series of overlapping channels which usually work on a step-by-step basis. Fourthly, new electronic communications technology is not, in any case, used equally everywhere in the City. As we have seen from the history of the use of such technology in the City, certain firms and institutions heartily embrace new technologies. But others drag their heels. "In spite of predictions that technology would eliminate distinctions between financial institutions, they have remained separate in culture, management style and business strategy" (*Financial Times*, 16 September 1992, p. 1). The City's information space cannot therefore be all of a piece since even the fact of connection (which cannot be guaranteed) does not automatically signify use. Fifthly, and finally, electronic communications technology is rarely used in the City in isolation. For example, in the case of traders it is a part of an 'actor-network' built up to produce profit. The trader acts as one node in this collective along with other traders and, integrally, the technology they use. Most important for the trader in this situation is the 'image' he or she conveys to colleagues, an image made up of particular forms of masculinity (or femininity), bodily stance (including speech), favoured interpretative schemes, *and style of use of the available technology* (intense, carefree, indifferent, and so on).

"It's very important—especially when

> you're working in a big team like we have here—that whatever you're feeling inside it shouldn't always be shown"... There is also the simple reality that emotional displays give away information to rivals with whom you are dealing. "It's all about how you display your image as well". (Roberts, 1995, p. 179)

In other words, telecommunications are not just used universally, but also *differently* by different groups of people.

The third reason why it is impossible to see the burgeoning information space as an abstract and inhuman space, strung out on the wire, is that its complexity and uncertainty, coupled with other factors like increasing competition, increasing cosmopolitanism and an increasingly female workforce, has driven the denizens of the City towards having to construct a more and more structured space of face-to-face interaction/interpretation. This 'dialogical City' of recent years, drawing on the close social traditions of the older city but extending them and also changing them, has produced a whole series of new or adjusted face-to-face social practices through which the 'informational frenzy' can be stabilised. These practices take many forms. There is the growth of the business card. Exchanging business cards is now a part of the ritual of meetings in the City in a way it never was before. There is the growth of the business lunch. There was always a lunching culture in the City—dating from the chophouses of the 19th century (see Kynaston, 1994)—but this has now been 'civilised'—becoming less masculine and less based on consumption of meat and drink—and much more widely practised.

> Laughing in the face of doomsters who forecasted the arrival of the desk sandwich lunch and the demise of the traditional City lunch, many restaurants claim they have never been busier. Evidence of restaurants bulging at the rafters at lunch periods provides ample testimony of the continued potency of lunch as an important part of the business tool (*sic*).
>
> The most active criticism of City food in the late eighties revolved around the lack of good choice and the poor value... both these criticisms have to a large extent been removed. While the central London restaurant community still has the edge, the City is no longer the gastronomic desert that perhaps it was. (*Square Meal*, 1995, p. 10)

Then there is the growth of the conference and the convention. As McRae (1994, p. 16) puts it:

> The world economy is developing in such a way that people need to communicate far more widely in order to do their jobs well. Professional jobs are becoming very complex and anyone doing them needs to find ways of meeting other people in a similar field to improve performance... their peers in other corporations or countries. A conference is often the only way people can meet.

Finally, there is the growth of the corporate hospitality industry. First formalised in the 1970s, corporate hospitality is now one of the mainstays of city sociability. Covering the full range of sporting and artistic events, as well as more mundane corporate golf and other sporting days ("few will disagree that as a way of building a relationship golf has few equals"); corporate hospitality is now estimated to be a £1bn industry by itself.

These comparatively new practices of face-to-face interaction have been backed up by increasing formalisation of the social encounter itself. This formalisation has been of three kinds. First, there has been the growth of formal 'relationship management' (Eccles and Crane, 1988). Relationship management is the attempt by City firms to bring order and coherence to the pursuit of personal relations so that they are more likely to bear business fruit and 'insider' information and interpretation. Secondly, much greater attention has been paid to work on the self, so as to produce more acute social skills. Workshops, round tables, videos, are all used to achieve a more personable workforce, again so as to produce more business. Finally, to

complete the circle, electronic technology is used as a technological supplement to face-to-face contacts, as well as in its own right. The telephone, fax and e-mail are all used as means of ordering face-to-face interaction. (Indeed, a number of workers now use computer programmes to schedule people to call and have lunch with on a regular basis in the pursuit of 'insider' information and interpretation.)

To summarise, what we see in the City of London looks less like an outbreak of a new and alien information space, inhabited by the plugged-in and the zoned-out, and more like a more complex, historically constructed set of 'technological' practices, peopled by the active and aware, built up out of negotiations and struggles amongst inventors, investors, competitors, organised customers, agencies of government, the media and others which gradually result in accepted definitions/uses of new electronic communications technologies, in a sense in their 're-invention' (Fischer, 1992). To put it in another vocabulary, the actors in these actor-networks redefine each other *in action* in ways which mean that there are no simple one-to-one relationships from technology to people but rather a constantly ongoing, constantly inventive and constantly reciprocal process of social acquaintance and re-acquaintance.

At the same time, the example of the City of London casts some doubt on the idea of the telematic city as a new kind of city at the nexus between a single unified, relativistic space of flows and a more prosaic Euclidean urban space. It is more accurate to say that contemporary telematic cities are the hybrid outcome of multiple processes of social figuration (Elias, 1982), processes which are specific to particular differentially extensive actor-networks (made up of people and things holding each other together) and generate their own spaces and times, which will sometimes, and sometimes not, be coincident. There is, in other words, no big picture of the modern City to be had but only a set of constantly evolving sketches.

The example of the City of London also suggests that new era theorists' ways of understanding modern cities are rather less different from ways of understanding earlier cities than they might want to admit. In particular, it suggests that the images and the rhetoric that new era theorists employ are the outcome of a complex geneaology of fantasies about technology. For example, there is the imperial fantasy of the City's role at the 'heart of empire' which seems to be intimately linked with fantasies about the control of information spaces (Cain and Hopkins, 1993a, 1993b). Thus Richards (1993), has traced the beginnings of the idea of an all-conquering information space to 19th-century fantasies of a total Imperial archive. That such fantasies of unity persist, but now, as Richards points out, transferred to the medium of technology, suggests that the processes of decolonisation of thinking which post-colonial theorists have instigated may have farther to go than some of these theorists have imagined.

> Understanding the fantasy of knowledge elevated to global power takes us a long way towards understanding the lure, and finally the persistence, of the much larger fantasy of empire itself. (Richards, 1993, p. 9)

Conclusions

> The historian's musings proposed in the present work thus lead to a question essential in our own present time—not the overworked question of the supposed disappearance of writing, which is more resistant than has been thought, but the question of a possible revolution in the forms of its dissemination and appropriation. (Chartier, 1994, p. 91)

Conclusion 1: The Order of the Screen

I do not want this paper to be perceived as simply an exercise in the debunking of new era writings, although they certainly need debunking. There also has to be, indeed there must be something 'new' about the present conjuncture; "there is no question that some-

thing new is at work while we all slip into a state of terminal identity" (Bukatman, 1993, p. 629).

That 'something new' seems to me to be the move from spatialising the largely invisible processes of information in one way—via writing—to spatialising them in another—via visual images.[14] For, as Barbara Maria Stafford (1991, 1994, 1995), one of the chief proponents of the view that we are now in transit to a new form of *oral-visual* culture, has argued:

> No one who has watched the computer graphic and interactive techniques revolution can doubt that we are returning to an oral-visual culture. Animation, virtual reality, fiber-optic video, laser disks, computer modelling, even e-mail, are part of a new vision and visionary art-science. (Stafford, 1994, p. xxx)

But, as Stafford goes on to argue, our ability to recognise, yet alone understand, this new oral-visual culture has been shrouded by two different sets of actors. One of these is the manufacturers of the new digital devices whose sales pitch is bound up with techno-hyperbole. The other set of actors are certain media critics who have inherited the suspicion of non-textualisable phenomena dating from the Enlightenment. They have

> reproduced, without realising it, the Enlightenment critique of merely beautiful appearances. Like the early moderns, they too deride the charlatanism of a bewitching optical technology and a cunning manual skill without compelling content performed to trick the masses. (Stafford, 1994, p. xxvii)

But, says Stafford, there is a third way. That is to welcome, though not uncritically, the new oral-visual culture rather than to see it as a new form of papist idolatry and to do so for two main reasons. The first of these is its emphasis on recuperating physical objects (including images) as important means of patterning existence as

> semiophores, or couriers of meaning (bearing witness) to a positive and instrumental materialism (and not just as) the passive drugs feeding our habit of consumption, but as cherished possessions. (Stafford, 1994, p. 3)

In other words, physical objects can again take their place as major sources of knowledge.

The second reason is because, while reading gradually became a silent and to an extent, isolated and isolating activity, the return of oral-visual culture also bears the possibility of again promoting a more open and interactive universe crisscrossed by "extra-linguistic messages, interactive speech acts, gestured conversations, and vivid pantomime" (Stafford, 1994, p. 3) in which the exchange of information is both creative *and* playful. Most particularly, it is to recognise the possibility of entrenching "a culture of high-level visual education to accompany the advances in visualisation", and to dispel the idea of a dichotomy between higher cognitive functions, represented by serious textual methods, and the physical manufacture of "pretty pictures", which are merely hedonistic entertainment. In other words, Stafford is working towards the idea of reinstating the mobile thought of colloquial discussion in new ways as an oral-visual drama in which concepts are variably generated and played with as tangible objects. In turn, argues Stafford, this kind of 'pleasurable learning' will require a new 'culture of politeness' (of the kind already found on e-mail) which can cope with this kind of discussion. To summarise, Stafford (1994, p. 286) argues that

> We are returning to the oral-visual culture of early modernism. To be sure, our world is more heterogeneous, fragmented, indeterminate and speeded up, because of computers and robotic systems. Indeed, it is difficult to imagine students in the manipulative and 'movieola' period of video or of electronic texts returning to scribal techniques. It is all the more important, then, to understand the role of visual analysis for abstract concepts such as human development, cognition, memory, in-

> telligence. No longer preliterate, we are postliterate. Yet, ironically, even within "postcolonial critical discourses" emphasising the global importance of 'hybridity' and the value of 'alterity' the temporal linearity of texts serves as a model for a transnational countermodernity. Might the patterns and shape of cultures, their transformation, and shifting relations, not be explored more effectively through randomisation, animation, computer modelling and morphing?

Such a view is echoed by Turkle and Papert who argue that the iconic style of modern computerised telecommunications can support a move towards a much greater emphasis on 'concrete' thinking based on the rise of computational 'objects', and towards greater 'epistemological pluralism' which is more inclusive.

> The development of a new computer culture would require more than environments where there is permission to work with highly personal approaches. It would require a new social construction of the computer, with a new set of intellectual and emotional values more like those applied to harpsichord than hammer. Since, increasingly computers are the tools people use to write, to design, to play with ideas and shapes and images, they should be addressed with a language that reflects the full range of human experiences and abilities. Changes in this direction would necessitate the reconstruction of our cultural assumptions about formal logic as the 'law of thought'. (Turkle and Papert, 1990, p. 153)

Stafford, Turkle and Papert may exaggerate—much of the new information space will remain resolutely based on text as the example of e-mail makes clear (Pound, 1993)—but they also seem to me to have produced an original point of view on the rise of informational space.

Conclusion 2: Back to the Future?

This brings me to a final point. If I had to choose a space and a time to which the current city seems closest, it would be the 18th-century city. This might seem a bizarre choice. Yet one might argue, on the basis of current historical research which has, to an extent, pushed back the historical frontier of 'modernity', that many of the current indexes of our present were already in place in the 18th-century city—from blossoming consumer cultures, through to many and variegated senses of time, from insecure nation states through to large and powerful financial markets (which, for example, already used futures), from greater freedom for certain kinds of women through to the heterogeneity of social groupings, from various new forms of public sphere (like the press and pamphlets) through to the play of many different forms of cultural apprehension (such as astrology and various forms of science). Most especially, the 18th-century city was the site of a blooming oral-visual culture (Stafford, 1991) to which I would argue that we are currently 'returning'; one in which the boundaries between art and science were less clear (see Serres, 1982), and one which was, partly through the sheer force of noise and smell, more entirely aware of the *vécu*, more open to what Prendergast (1992) calls an "epidermal sensibility". I would argue that what followed the 18th-century city—the controlled spaces of the 19th-century specular order, based upon the hegemony of print—is now being either cleared away or highly modified. We are moving, in other words, towards a city which generates, attends and reflects an oral-visual culture, a city in which pixels are re-placing moveable type, a city which offers new 'affordances', that is, new cultural resources, new vocabularies, new senses of how to do things, some of which are good, some of which are bad, and each of which offers new ocular, kinaesthetic, tactile and auditory skills (Thrift, 1996; Stallabrass, 1995).

This new 'city of bits' (Mitchell, 1995) displays many of the same elements as the 18th-century city, from its emphasis on consumption to its many and variegated senses of time, from the insecurity of the nation state through to large and powerful financial

markets, from greater freedom for certain women (in certain senses) through to the diversity of social groups, from various new forms of the public sphere (like e-mail and the internet), through to the play of many different forms of cultural apprehension (from new age religions, through many implicit religions, to the fact that we probably live at the high point of astrology), from a belief in all manner of monsters and mythologies (lurking in the sewers, or coming out of the television and computer screens), through to a renewed appreciation of the ordinary marvels of everyday (and night) life (Thrift, 1994a). Most particularly, it seems to me that, in opposition to Jameson's ideas of vaulting and dysfunctional post-modern cities or Sennett's (1994) and others' laments for community lost, what we see is a city—a more dispersed city it is true—which still exists on a human (but not humanistic) scale and is still caught up in identifiably human concerns. I therefore find it oddly reassuring that the largest number of Internet bulletin boards are concerned with *Star Trek*, and that much of the discussion on the Internet is concerned with sex (Sabbagh, 1994; Moore, 1995; Stone, 1995; Wiley, 1995). It also suggests that we should be about as worried about the 'return' of electronic oral-visual cultures as non-electronic oral-visual cultures were worried by the rise of literate cultures. These new cultures will certainly change our apprehension of the urban world and in quite severe ways, but we will still have many customs in common with the past. The new era will still contain many echoes of the old. In other words, business will go on, but never as usual—because it never has.[15]

Notes

1. Even the accounts of that most subtle of the writers in this area, Donna Haraway, are not immune from this kind of hyperbole (Barker, 1995).
2. One thinks of the enormous number of repair functions in any *Yellow Pages* (see also Sayer and Walker, 1992).
3. And this is not all. Until recently, for example, the Amish 'shunned' telephones. Even now, they only use jointly accessed community telephones (Umble, 1992).
4. Spurred on, of course, by the way in which many new electronic communications technologies have reversed the idea of a 'broadcast' model of few producers and many consumers (Poster, 1995).
5. There are, of course, many communities of practice using electronic communications technologies in particular more or less techno-literature ways to particular ends. What we need are studies which attend to the range and depth of this cultural variation.
6. Several Stock Exchange syndicates monitored pigeon lofts in the 1830s and 1840s.
7. The cable was linked to the Stock Exchange in 1853.
8. These exchanges, both run by private companies, were located at 6 Lombard Street (Edison Company) and 36 Coleman Street (Telephone Company), both in the heart of the City.
9. Similarly, "one well-known firm had (the telephone) installed in the lavatory, apparently believing that if it were in any more accessible a place, it would encourage the clerks to waste time on private calls" (Morgan and Thomas, 1962, p.163).
10. Even though much business was forced to go on outside the Exchange.
11. In part, the new Stock Exchange building, opened in 1972, was built in order to accommodate increasing telecommunications demands.
12. Which lead to the use of pagers. Thus Jenkins (1973, p. 103) could write of the Stock Exchange in 1972:

> The new paging system, specifically designed by Modern Telephones Ltd, is one of the fastest in the world and can handle 1200 calls per minute. There are 1,500 receivers, remotely controlled from 280 points, and the system could be expanded to 4,000 receivers if necessary. This is perhaps the greatest change noticed by older Members. From 1801 until 1970, the normal method of calling a Member on the Floor was the stentorian voice of 'a waiter' (so-called from coffee-house days) or a flashing number above a Member's stand. Now Members carry pocket 'bleepers'—small microwave radios by which they can be reached anywhere on the Floor or... in neighbouring pubs and cafes.

The mobile phone has changed all this again. Yet, throughout the history of the City pri-

vate messenger and courier services have continued to operate, nowadays especially to guarantee secure delivery of documents. Thus, it is important to note that international document delivery, by United Parcel Services in the City, still, in part at least, relies on 11 walking couriers (*The Independent*, 15 June 1994, p, 23). Again, the rise of the bicycle courier in the City in the 1980s cannot be ignored.

13. On one reckoning, 60 per cent of all British telecommunications expenditure originates or ends in London. Firms in the City spend £200m a month on international direct dialling, which does not take into account their expenditure on private calls (City Research Project, 1995).
14. This tendency is now as far advanced in the world of international finance as elsewhere. Firms like Visible Decisions specialise in three-dimensional graphics for international finance, as an aid to traders and investors in seeing what they are doing, as a risk management tool, and as a way of making speedier decisions (*The Economist*, 25 August 1995, p, 75). But, the greatest use of visualisation may well be in allowing managers to understand what is going on, a problem the Barings' dêbâcle suggests is still widespread, even in an age of 'rocket science' (Motluk, 1995).
15. In any case, as other new technologies proceed, I believe that the current obsession with electronic spaces may well diminish. See for example, Stephenson's (1995) remarkable move into nanotechnology.

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